

# **COST**

Domain Committee MPNS

## **COST Action MP1106**

**Start Date 02/06/2012**

*Smart and green interfaces - from single bubbles and drops to industrial, environmental and biomedical applications (SGI)*

### **MONITORING PROGRESS REPORT**

**Reporting Period:** *from 02/06/2013)*  
*to 01/06/2014*

This Report is presented to the relevant Domain Committee.  
It contains three parts:

- I. Management Report prepared by the COST Office/Grant Holder***
- II. Scientific Report prepared by the Chair of the Management Committee of the Action***
- III. Previous versions of the Scientific Report; i.e., part II of past reporting periods***

The report is a “cumulative” report, i.e. it is updated annually and covers the entire period of the Action.

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.D. Self evaluation*.

Based on the monitoring results, the COST Office will decide on the following year’s budget allocation.

#### **Executive summary (max.250 words):**

The scientific objective of the MP1106 Action is to identify and implement best strategies and means to tailor Smart & Green interfaces and accurately control their performance by concerted action of the most active European research institutes and companies in the field. To meet this challenges the Action brings together science and technology teams of disperse expertise from Europe (and beyond) to reinforce academia-industry interaction at early stages of knowledge development. During the second year of the Action we organized three combined WG1-4 meetings, three training schools, a Core Group meeting and the second Annual Workshop/MC meeting. From the 12 STSMs, 10 were conducted by Early Stage Researchers. In the second year of the Action, 84 scientific articles have been published and 7 Patents have been filed (117 and 9, respectively, in total since the beginning of the Action). In addition, the COST Action acts as a springboard for collaborative funding applications: several joint applications have been submitted both to EU and to national programmes, some of which have been accepted for funding. For next year planned activities include 1 training school, 15 STSMs, 3 Combined WGs meetings and an Annual Workshop/MC meeting.

## I. Management Report prepared by the COST Office/Grant Holder



### I.A. COST Action Fact Sheet

- **COST Action** MP1106 - *Smart and green interfaces - from single bubbles and drops to industrial, environmental and biomedical applications (SGI).*
- **Domain** MPNS

- **Action details:**

**CSO Approval:** 01/12/2011

**End date:** 10/05/2016

**Entry into force:** 06/01/2012

**Extension:** (day/month/year)

- **Objectives** *Bubbles and drops are entities of enormous practical interest since their interfaces are met in numerous industrial processes and applications of every day life. In order to enhance efficiency, the creation of revolutionary Smart interfaces is demanded: interfaces that are easily manipulated with well-controlled size and properties. The acute modern environmental problems require attributing eco-friendly features to Smart interfaces by incorporating innovative materials or processes. The outcome is Smart and Green (S&G) interfaces. The objective of this Action is to organize a network of groups from academia and industry in order to identify best strategies and means to produce S&G interfaces. Furthermore, state-of-the-art experimental, theoretical and numerical work will be combined to acquire insight into the underlying phenomena through the scales and across the disciplines for the implementation of S&G interfaces in industrial, environmental and biomedical applications. The Action's main deliverables are the networking between groups working on different aspects of S&G interfaces through organization of scientific events, training schools and STSMs, and the industrial interface to market new technologies. The professional perspectives of ESRs will be boosted through an extensive mobility program. The Action's main benefit is the endorsement of the European scientific and industrial leadership in this field*

- **Parties:** *list of countries and date of acceptance*

Austria 30/01/2012	Germany 18/01/2012	Norway 02/02/2012
Belgium 09/02/2012	Greece 23/01/2012	Poland 18/01/2012
Bosnia and Herzegovina 26/06/2014	Hungary 05/03/2012	Portugal 06/01/2012
Bulgaria 20/01/2012	Iceland -----	Romania 15/03/2012
Croatia 11/01/2012	Ireland 16/01/2012	Serbia 24/02/2012
Cyprus -----	Israel 27/12/2011	Slovakia 23/03/2012
Czech Rep. 10/02/2012	Italy 13/01/2012	Slovenia 05/01/2012
Denmark 29/03/2012	Latvia 07/11/2012	Spain 04/01/2012
Estonia 11/04/2012	Lithuania 23/05/2013	Sweden 09/08/2013
Finland 03/05/2012	Luxembourg 27/04/2012	Switzerland 14/12/2012
FYR of Macedonia -----	Malta -----	Turkey 15/03/2012
France 23/03/2012	Netherlands 17/01/2012	United Kingdom 09/12/2011

- **Intentions to accept:** *No*

- **Other participants:**

*University of Alberta, Canada, Alberta*

*Lafayette College, USA, Easton*

*Ian Wark Research Institute, Australia, Adelais*

*University of Aukland, New Zealand, Aukland*

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- **Grant Holder Representative** Dr. John Lioumbas, [Lioumbas@gmail.com](mailto:Lioumbas@gmail.com)
- **Working Groups** (list of WGs and names and affiliations of participants)

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**WG2:** Materials

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**WG3:** Diagnostics

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**WG ESR** (Early Stage Researchers)

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8	Leonor	Pérez Fuentes	University of Granada

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### WG3 - Diagnostics

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#### WG4 - Technology

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51	Nikos	Giannoulidis	Euroconsultants S.A.
52	Giovanni	Libralato	Veneto Nanotech S.C.p.A.
53	Süreyya	Meriç Pagano	Namik Kemal University
54	Giusy	Lofrano	University of Salerno
55	Rute	Domingos	Instituto Superior Técnico
56	Gonçalo	Vale	Instituto Superior Técnico
57	Gianluca	Li Puma	Loughborough University, UK
58	Witold	Lojkowski	Institute of High Pressure Physics, PAS
59	Huseyin	Selcuk	Istanbul University, TR
60	Stoyan	Smoukov	University of Cambridge
61	Stephan	Wagner	University of Vienna
62	Sonja	Hartl	BioNanoNet Forschungsgesellschaft mbH
63	Klaus	Unfried	IUF Leibniz Research Institute for Environmental Medicine
64	Stoyan	Karakashev	Sofia University
65	Zhenyu	Zhang	University of Strathclyde, UK

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**ESRG**

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	Name	Surname	Affiliation
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3	Jan	Zawala	Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences
4	Virginie	Papadopoulou	Imperial College London & Haute Ecole Paul Henri Spaak
5	Michel	Lebon	University of Toulouse
6	Jaroslav	Katona	University of Novi Sad, Serbia
7	Laura	Arévalo	University of Zaragoza
8	José Alberto	Lorda	University of Zaragoza
9	Eva	Roche	University of Zaragoza
10	Katarzyna	Jabłczyńska	Warsaw University of Technology
11	Marcin	Odziomek	Warsaw University of Technology
12	Katarzyna	Kramek-Romanowska	Warsaw University of Technology
13	Sandra	Njaradi	University of Novi Sad, Serbia
14	Francesc	Suñol	Universitat Politècnica de Catalunya
15	Jadranka	Milanovic	University of Novi Sad, Serbia
16	Ileana	Malavasi	Università di Bergamo
17	Anna	Garcia-Sabaté	Universitat Politècnica de Catalunya
18	Tereza	Váchová	ICT Prague
19	Zuzana	Brabcová	ICT Prague
20	Christos	Koukiotis	Loufakis Chemicals SA
21	Mindaugas	Milieška	Lithuanian Energy Institute
22	Sonia	Eugenio	IST - Lisboa Portugal
23	Brankica	Marceta	University of Novi Sad Serbia
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26	Lucie	Vobecka	ICPF, Prague
27	Petr	Stanovsky	ICPF, Prague
28	Christopher	Hamlett	Nottingham Trent University, UK
29	Dario	Donnarumma	University of Naples Federico II
30	Antonio	Perazzo	University of Naples Federico II
31	Rosa	D'Apolito	University of Naples Federico II
32	Giovanna	Tomaiuolo	University of Naples Federico II

33	Jakub	Nowakowski	Institute of Fundamental Technological Research, Polish Academy of Sciences
34	Christophe	Trabi	Nottingham Trent university
35	Joseph	Brennan	Nottingham Trent University
36	Nicasio	Geraldi	Nottingham Trent University
37	Federico	Quinci	University of Southampton
38	BEN	XU	University of Northumbria at Newcastle
39	Mihai	Boni	National Institute for Laser Plasma and Radiation Physics
40	Leonor	Pérez Fuentes	University of Granada
41	Miguel Angel	Fernández Rodríguez	University of Granada
42	Beatriz	García Martínez	Institut Català de Nanociència i Nanotecnologia (ICN2)
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45	Nikos	Giannoulidis	Euroconsultants S.A.
46	Giovanni	Libralato	Veneto Nanotech S.C.p.A.
47	Efthalia	Chatzisyneon	The University of Edinburgh
48	Arjen	Markus	Deltares & University of Amsterdam
49	Giusy	Lofrano	University of Salerno
50	Rute	Domingos	Instituto Superior Técnico
51	Nikolaos	Kokkinos	Hephaestus Research Laboratory
52	Andra Cristina	Dinache	National Institute for Laser, Plasma and Radiation Physics
53	Gonçalo	Vale	Instituto Superior Técnico
54	Samantha	Donnellan	Heriot Watt University
55	Vamseekrishna	Ulaganathan	MPI of Colloids and Interfaces, Potsdam, Germany.
56	Mohsen	Karbaschi	MPI of Colloids and Interfaces, Potsdam, Germany
57	Martin	Laporte	University of Nantes
58	Stephan	Wagner	University of Vienna
59	Arianna M.	Marucco	University of Torino
60	Anna	Gyurova	Institute of Physical Chemistry, Bulgarian Academy of Sciences, Sofia, Bulgaria

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Prof. Victor STAROV	United Kingdom	V.M.Starov@lboro.ac.uk



## I.C. Overview activities and expenditure

**(year) Budget**                      2013    183,000.00

**Total Action Budget:**                      **213418.00**

**Remaining Action Commitment:**                      **3479.32**

### Meetings

Meeting Type	Date	Place	Cost	Total
Workshops/Conferences	2013-09-06	Sofia	23324.03	
Workshops/Conferences	2013-10-04	Zaragoza	10814.12	
Workshops/Conferences	2013-11-14	Cargèse	14367.77	
Core Group Meeting	2013-12-13	Thessaloniki	0	
Management Committee Meeting	2014-04-24	Marseilles	79686.32	<b>128192.24</b>

### STSM

Beneficiary	Date	Place	Cost	Total
Ms Marceta Brankica	2013-07-01	2013-08-09	Faculty for Engineering Technology University of Twente, Enschede, Netherlands	2400.00
Dr Antonio Perazzo	2013-07-22	2013-08-23	Max-Planck-Institut für Kolloid-und Grenzflächenforschung Potsdam Germany	2300.00
Mr Alexandros Askounis	2013-07-22	2013-07-29	School of Chemistry, Aristotle University of Thessaloniki Greece	800.00
Ms Leonor Perez Fuentes	2013-09-16	2013-12-16	Centre de Recherche Paul Pascal - CNRS (Université Bordeaux) Pessac France	2400.00
Mr Miguel Ángel Fernández Rodríguez	2013-09-23	2013-12-23	ETH Zürich - Eidgenössische Technische Hochschule Zürich Switzerland	3500.00
Ms Virginie Papadopoulou	2013-10-06	2013-10-27	Aristotle University, Department of Chemistry, Thessaloniki, Greece	2000.00
Ms Zuzana Brabcova	2013-10-14	2014-02-07	Aristotle University of Thessaloniki Greece	3500.00
Dr Christophe Wylock	2013-10-20	2013-10-26	Institut de Mécanique des Fluides de Toulouse (IMFT) Toulouse France	800.00
Mr Federico Quinci	2013-11-07	2013-12-07	Dept. Life Sciences and Biotechnology, University of Ferrara Ferrara Italy	2100.00

Dr Alexander Kartushinsky	2014-01-06	2014-01-10	University of Technology Eindhoven Netherlands	850.00	
Mr Vamseekrishna Ulaganathan	2014-04-22	2014-05-05	CNR-IENI Genoa Italy	900.00	
Mr Christopher Hamlett	2014-05-12	2014-05-23	Laboratoire de Physique des Solides, Université Paris Sud Paris France	1480.00	<b>22950</b>

#### Workshops

Title	Date		Place		Cost	Total
	From	To	From	To		
						<b>0</b>

#### General Support Grants

Beneficiary	Date								Cost	Total
										<b>0</b>

#### Schools

Title	Date	Place	Cost	Total
Cultivating Entrepreneurial Ideas...	2013-07-18	Thessaloniki	11339.51	
Particles at Liquid Interfaces: Fundamentals and Applications	2014-04-05	Bonassola	10790.98	
International Advanced Course in Liquid Interfaces, Drops and Sprays (LIDESP)	2014-05-10	Darmstadt	6597.95	
				<b>28728.44</b>

#### Dissemination

Title	Date	Place							Cost	Total
Action Website	2013-11-04	web							1040	
Other (Action Website)	2014-03-27	web							560	<b>1600</b>

#### Others

Banking costs	631
FSAC	27837

**Action Total :**

**209938.68**

**II. Scientific Report** prepared by the Chair of the Management Committee of the Action, describing results achieved during the Action operation in this period, in no more than 3 pages (the report is “cumulative”). All items listed in Sections A, B, and C, below, must be addressed.

Additional documentation such as extended scientific reports, proceedings of workshops, seminars or conferences may be provided separately as an annex to this report, and should be referenced in the report.

### **II.A. Innovative networking**

- Innovative knowledge resulting from COST networking through the Action. (Specific examples of Results vs. Objectives)

Below are some of the projects realized in the frame of WGs that yielded new knowledge. It is a particular feature of the Action that many members participate in several WGs so discrimination per WG is not easy. Due to space limitations only the name(s) of the basic coordinating scientist(s) is mentioned.

1. Scientific highlights as part of the COST Action. (Specific examples)
  - ❖ *The Maximum Bubble Pressure method was adapted to study the influence of nanoparticles and inhaled medicaments on the surface activity of lung surfactant (Sosnowski - Warsaw University of Technology)*
  - ❖ *Significant new results about the entrainment of liquid films by plates (Landau-Levich problem) or open frames (Frankel problem) in the presence of surfactants have been obtained, defining the critical surface tension gradients involved in the flow regimes. (Scheid, ULB Belgium & Rio, University Paris Sud).*
  - ❖ *The effects of cationic surfactants on the surface properties of sea water have been investigated, in relation to the possibility to develop monitoring devices for the early warning of pollutions based on surface science concepts. Concerned to the same topic, bubble rising investigation. (Liggieri, Ravera, CNR-IENI Italy & MillerMPI-KGF-Germany).*
  - ❖ *Significant new insights have also been obtained on the interaction of nanoparticles with phospholipid layers, relevant for nanotoxicology and for the application of nanotechnologies to different biomedical issues, based on the utilisation of concepts and methods from surface science. (Ravera, CNR-IENI).*
  - ❖ *A novel centrifugal technique has been proposed for studying droplet's contact line motion dynamics on solid substrates under the influence of varying body forces. The device is designed and preliminary tests are performed on droplet spreading over solid substrates made of different materials. Technical issues are dealt with regarding optical imaging and rotation speed. (Karapantsios, Kostoglou, AUTH Thessaloniki).*
  - ❖ *An analysis of a bubble-in-liquid bridge configuration has been provided as prototype for studying foam dynamics. In the context of developing a device for the assessment of foam stability based on the liquid bridge-bubble configuration, a complete theoretical analysis for the system bridge-bubble in the absence of gravity is presented. (Karapantsios, Kostoglou, AUTH Thessaloniki).*
  - ❖ *Studies on nanoassemblies of four-antennary oligoglycines have shown that they can be used as captive agents for endotoxins (LPS) in aqueous systems. (E. Mileva – BAN Sofia , S. Stoyanov - Unilever).*
  - ❖ *Novel treatment of textile materials by drug solutions exposed to laser radiation in order to be used on the human skin. Some of the phenothiazine solutions exposed prolonged time intervals to laser radiation have much better activity against several bacteria. (Dutschk NL, Pascu RO)*

- ❖ *Manufacturing and stabilisation of multiple (w/o/w) emulsions for food industry and study their interfacial properties using Profile Analysis Tensiometer. (Dutschk NL, Katona RS)*
- ❖ *Particle characterization at interfaces by Light Extinction Spectroscopy technique; Dependency of light extinction on the normalized particle-interface distance; silicon Carbide particle of 1µm suspended in water (Colinet BE)*
- ❖ *Characterization of w/o adsorption layers composed of oil soluble emulsifiers and vegetable fats (Dutschk NL, Katona RS)*
- ❖ *Wetting studies regarding amphiphilic molecules and adsorption properties on highly water repellent solid surfaces (superhydrophobic-SH). Preparation of SH surfaces by a mixed inorganic-organic coating on different substrates and studied in presence of different surface active molecules. Transition between wetting states can be also considered a possible development of these studies based on switching mechanisms. (Ferrari CNR-IENI, IT).*
- ❖ *Nano-functionalization of textile materials; preparation of polymeric compositions for sponges to be used for loading of active ingredients such as plant polyphenols, antibiotics (MP1106 & CM1101; Dutschk NL, Šaponjic RS, & Liesiene LT)*
- ❖ *Surfactant Multilamellar Vesicles deformation in flow have been interpreted in terms of the internal microstructure and described on the basis of non-dimensional scaling parameters (Guido & Caserta, IT)*
- ❖ *The role of a multilamellar microstructure in the dynamic evolution in flow of the microstructure of surfactant vesicles was investigated by flow visualization (Guido & Caserta, IT)*
- ❖ *Concept and investigation of novel aerosol drug carrier based on multicomponent (composite) powders (Sosnowski – PL)*
- ❖ *Nanoporous metallic foams based on electrodeposition on hydrogen bubbles with possible applications to supercapacitors electrodes or catalysts for hydrogen production (F. Montemor – PT)*
- ❖ *New surfaces reducing bacterial infection; these surfaces belong to the class of green chemistry materials since the disinfection needs as reagents air (O<sub>2</sub>), water vapour (air) and light (low intensity solar irradiation); disinfection by mild environmental processes applying a relatively new sputtering technology to produce thinner coated surfaces requiring much lower amounts of non-renewable metal resources like Cu, Ag. (Kiwi CH)*
- ❖ *A systematic investigation of shear-induced banding in confined biphasic liquid-liquid systems was done by rheo-optical investigation. Rheological measurements show that band formation is associated with a viscosity decrease with respect to the homogeneous case, thus implying that system microstructure is somehow evolving toward reduced viscous dissipation under flow. (Guido & Caserta, IT)*
- ❖ *Novel microrheology techniques, based on optical tweezing, have been compared to classical bulk rheology methods, in the case of low viscoelastic hydrogels. (Guido & Caserta, IT)*
- ❖ *Fabricating superhydrophobic aluminum by one-step wet synthesis using fluoroalkyl silane; applications as superhydrophobic coatings on helicopter blades, understanding ice shedding properties (Malavasi, Marengo IT)*
- ❖ *Innovative nanoparticulate TiO<sub>2</sub> surfaces leading to the loss of bacterial viability within with the time of cell-wall damage in the dark (Kiwi, CH)*
- ❖ *Mixing of multiphase fluids have been investigated in the case of non-newtonian phases by microfluidic techniques. (Guido & Caserta, IT)*
- ❖ *Stem cells that lead to differentiation up to "beating" cardiomyocytes on Organic Field-Effect Transistors (OFET) that can represent a powerful tool for the detection of bio-signals because of their electrically active surface is an organic film (Guido & Caserta IT).*

- ❖ *Low energy emulsification of surfactant stabilized oil-water emulsion can be obtained by phase inversion. System microstructure is characterized by rheological measurements and confocal imaging. (Guido & Caserta, IT)*
- ❖ *The flow behavior of RBCs in glass microcapillaries coated with a polymer brush has been studied, developing a model of endothelia glycocalyx in vitro using a microfluidic approach. (Guido, IT)*

2. Significant scientific breakthroughs as part of the COST Action. (Specific examples)

- ❖ *A new type of experiments arranged in a Capillary Pressure Tensiometer to investigate surface properties of bubble rising in a surfactant solution. (R. Miller – MPI-KGF Germany)*
- ❖ *Experiments on bouncing bubbles at the liquid interface demonstrating the possibility to maintain the bubble bouncing, without coalescence, by supplying kinetic energy in the form of applied vibrations of proper frequency and amplitude. (K. Malysa PAN- Krakow)*
- ❖ *Digital Holographic Interferometry, has been applied for the first time to obtain quantitative information about the local evaporation rates and temperatures along the interface of an evaporating droplet (P. Colinet, ULB Belgium).*
- ❖ *Methods for the production of microporous ceramic and carbonaceous materials from particle-stabilised foams have been set-up, deriving correlations between the interfacial properties of the precursors liquids (water+particles+surfactants+additives) and specific morphological features of the materials.(Liggieri, Ravera, CNR-IENI Italy)*
- ❖ *An innovative rapid test has been patented to safely and easily distinguish fresh from prolonged fried oil based on the wicking speed (penetration rate of oil/gas interface) of oil into porous paper (Karapantsios, Lioumbas, AUTH Thessaloniki).*
- ❖ *The pendant-drop method with drop-shape analysis (DSA) and capillary pressure tensiometry (PT) have been applied to investigate highly elastic adsorption layers such as those involving solid particles, lipids, polymers, etc. , which are particularly relevant for advanced applications. (K. Marinova, Sofia University)*
- ❖ *Development and scale-up of novel protein microfibers for structuring and encapsulation using in-shear solvent attrition”, in collaboration with WUR, Unilever and Friesland Campina, focusing on green (solvent free) methods for creation of protein micro-fiber for sustainable food products (S. Stoyanov – NL)*

3. Tangible medium term socio-economic impacts achieved or expected. (Specific examples)

*Alike in the first year of the Action, it is still early to quantify tangible socio-economic impacts. A major part of the world's commercial and industrial sector in the field of smart and green interfaces is based in Europe. From a socio-economic point of view, this warrants working positions, training and career opportunities for early stage researchers. In addition, there is a clear benefit from exporting innovative products and technologies outside Europe.*

*Seven (7) PhD students and fifteen (15) MS students started their work in the Action teams (Annex I).*

4. Spin off of new EC RTD Framework Programme proposals/projects. (List)

1. *Complex Spread, (Marie Curie EU-ITN FP7, Gambaryan—Roisman DE, Starov UK, Miller DE, Dutschk NL, Karapantsios GR and other teams not part of this COST project)*
2. *FOAM-C MAP Project (ESA/ELIPS-4, Langevin, FR, Liggieri IT, Miller DE, Karapantsios GR)*
3. *SCADA-Water, ICT-2013.6.3 ICT for water resource management, (Drop Technology, IR; decision not funded)*

4. *Highly efficient flow boiling macro-structured/macro-porous channels (ESA/NPI Karapantsios GR, Siemens GE).*
5. *Biocide management for long term water storage (ESA/TRP, Karapantsios GR).*
6. *Advanced Multi-physics Simulation Technology, (Marie Curie EU-ITN FP7, Peters LU and other teams not part of this COST project)*
7. *EPSRC/EU Call identifier: FP7-NMP-2013-LARGE-7 (Sefiane UK).*
8. *EVAPORATION MAP Project (ESA/ELIPS-4 Colinet BE, Antoni FR, Tadrist FR, Brutin FR), Stephan DE, Gambaryan DE), and other teams not part of this COST project.*

5. Spin off of new National Programme proposals/projects. (List)

- *A new STW project approved on “Development and scale-up of novel protein microfibers for structuring and encapsulation using in-shear solvent attrition”, in collaboration with the University of Wageningen, Unilever and Friesland Campina, focusing on green (solvent free) methods for creation of protein micro-fiber for sustainable food products (Stoyanov, NL).*
- *EPSRC CASE PhD Grant together with Hull University UK on creation of smart, green (construction) porous materials (Stoyanov, NL)*
- *A new national project PBS-3: research program of the National Science for Research and Development NCBR – Poland (Sosnowski PL)*
- *An industrial cooperation Dynamics of high-frequency drop formation, Agfa, Belgium and Encapsulation of essential oils, Essentico, Serbia (Katona RS)*
- *Advanced flow boiling over modified surfaces, National Fellowship of Excellence (Karapantsios GR).*
- *Proposal submitted to STRATEGMED - national strategic program focused on prevention and therapy of diseases of affluence (Sosnowski PL).*
- *A project HARMONIA 5 was obtained by the Warsaw University of Technology in the framework of the research program of National Science Center (NCN - Poland).*
- *A new national project was submitted by the PAN group in Krakow and received funding: “Mechanism and kinetics of a bubble coalescence at undisturbed and vibrating with controlled frequency liquid/gas interfaces” for the period 2014-2017 - J. Zawala (Head of the project)*
- *The group of Novy Sad run a project on Dynamics of high-frequency drop formation with Agfa in Belgium*
- *Bilateral project on mixed nanoparticle-fatty acid layers at droplet interface (L. Liggieri – IT, collaboration with SY Lin, TU Taiwan).*
- *Joined Erasmus application of Elena Mileva (BAN Sofia) and Marcel Krzan, Kazimierz Malysa (PAN Krakow).*
- *Industrial Project related to multiphase systems dissolution. (Guido, IT)*
- *Industrial Project related to Smart Interfaces in food products. (Guido & Caserta, IT)*
- *Joint project on motion of disperse phases in viscoelastic liquid carrier phase. submitted to German Research Foundation (DFG) and Austrian Science Fund (FWF) (G. Brenn – AT)*

## **II.B. Inter-disciplinary networking**

- Additional knowledge obtained from working with other disciplines within the COST framework. (Specific examples)

*MP1106 Action is by definition a multi-disciplinary network that acts as a catalyst to pool knowledge, methods and techniques together and enable intellectual and practical exchanges. So responses to this section actually coincide with those at the previous one. Most STSMs have given the applicant to have access to specialized techniques and knowledge not available in the host lab. Yet, to discriminate further we present below knowledge gained from collaboration with colleagues outside MP1106.*

1. *Nickel-copper, cobalt-copper, nickel-cobalt-copper NMFS have been tested as catalysts for hydrogen production through the hydrolysis of sodium borohydride (NaBH<sub>4</sub>). This is*

*an ongoing work, in collaboration with partners in COST action MP1103-Nanostructured materials for solid-state hydrogen storage and that results from the collaboration between IST and Université Montpellier, France (Montemor PT & Demirci FR).*

2. *Incorporation of silver nanoparticles to a new composite material based on methacrylate hydrogel (Prokopovich UK, María Isabel González-Sánchez from Universidad Complutense de Madrid, Madrid, Spain, COST-STSM-CM1101-12653).*
  3. *Study of bacterial adhesion on surfaces with various roughnesses using AFM (Prokopovich UK, Damijan Nipič SLO from COST-STSM-CM1101-13241).*
  4. *Manufacturing of highly porous metallic foams containing nickel, cobalt, iron and copper, and several combinations of these metals. Nickel-copper and copper-iron NMFs show interesting properties for application as electrodes in asymmetric supercapacitors, a work that is integrated in COST action MP1004-Hybrid Energy Storage Devices and Systems for Mobile and Stationary Applications (Montemor PT).*
  5. *Nano-functionalization of textile materials; preparation of polymeric compositions for sponges to be used for loading of active ingredients such as plant polyphenols, antibiotics (MP1106 & CM1101; Dutschk NL, Šaponjic RS, & Liesiene LT)*
  6. *What determines the size of a bubble? Characterization of the interfacial properties of bubbling solutions to determine the role of the interfacial rheology in bubble formation (Fairhurst UK, Pugh CH, Salonen FR).*
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide scientific impacts. (Specific examples)*

*MP1106 Action combines scientists of various expertise and background that bridge the gaps through the scales and across the disciplines in terms of state-of-the-art experimental, theoretical and numerical work. So the level of inter-disciplinarity in the action is more than sufficient to produce scientific impacts. This is reflected in the examples of projects outlined below and also in the many common publications ([Annex II](#)).*

1. *Dynamic evolution of biological soft matter has been investigated by in-vitro Time Lapse Microscopy and image analysis techniques. The methodology has been applied to the investigation of several physiological and pathological processes with potential diagnostic applications in several fields, such as wound remediation, cancer invasion, inflammatory processes, diabetes and celiac disease. (Guido & Caserta, IT)*
2. *Continuous flow operation has become a popular route for chemical synthesis also because they allow for a better control of selectivity and a more efficient handling of safety issues. The presence of a multiphase systems can strongly influence the mass transport and in microfluidic condition the flow can be also strongly affected up to the complete clogging of the reactor. The efficiency of batch reactor was compared to continuous microfluidic systems for the synthesis of cross-coupling C-N (known as the reaction of Buchwald-Hartwig), widely used in the pharmaceutical industry. (Guido & Caserta, IT)*
3. *The correlation between cystic fibrosis sputum viscoelastic properties and disease severity, was investigated in terms of FEV1% and bacterial colonization, presenting the elastic modulus of airways mucus as a new diagnostic parameter for the evaluation of disease severity in CF patients. (Guido & Caserta, IT)*
4. *Antimicrobial cellulose-based bandages with cysteine coated silver nanoparticles (Prokopovich UK, Sandra Gustaite, PhD student from the Department of Organic Technology, Faculty of Chemical Technology, Kaunas University of Technology, Kaunas, Lithuania COST-STSM-ECOST-STSM-CM1101-300913-035460).*
5. *Surface and colloid science concepts have been applied to investigate different aspects of the interaction of nanoparticles with biological materials for nanotoxicology, drug delivery and biotechnology, such as:*



- Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide socio-economic impacts. (Specific examples)
 

*It is still too early to argue about tangible socio-economic impacts. However, MP1106 Action is expected to have in the future appreciable impacts not only as a result of the sufficient inter-disciplinarity of the participating partners but also because of the clear orientation towards applications (industrial, environmental and biomedical). On this account, the last year there have been submitted different patents (Annex III).*

## **II.C. New networking**

- Additional new members joining the Action during its life.
 

*27 signatory parties (countries) have signed the MoU upon the kick-off meeting. During the first year of the Action the number of signatory parties raised to 30. During the second year of the Action the number of signatory parties raised to 32 with the addition of Sweden and Bosnia & Herzegovina.. Participation to Working Groups has changed since the beginning of the Action: WG1 from 42 to 111 members (from 26 countries), WG2 from 79 to 109 (from 25 countries), WG3 from 38 to 50 members (from 15 countries), WG4 from 33 to 65 members (from 20 countries). Many members participate in more than one WG. The Early Stage Researcher Group (ESRG) has currently 60 members (from 16 countries).*
- Total number of individual participants involved in the Action work. (Number of participants. Give % of female and of Early Stage Researcher participants)
 

*At the 2<sup>nd</sup> year the Action 395 individual members from 128 research groups have been involved in the Action work. From them, females are 28% and ESRs are 44%.*
- Involvement of Early Stage Researchers in the Action, in particular with respect to STSM s, networking activities, and Training Schools. In addition, justification should be provided if less than 4 STSMs were carried out during the year.
 

*The Action has a high number of ESRs and there is a dedicated ESR Group containing ESRs horizontally from all WGs to help in organizing workshops and training schools/seminars, promoting interaction within the WGs and disseminate post-doc/work placements. Some ESRs are MC members and therefore directly involved in the management of the Action.*

*From the 12 STSMs of the 2<sup>nd</sup> year of the Action, 10 were conducted by ESRs (Annex IV). In networking activities (WGs meetings, annual conference and Mc meetings) there were 49 involved ESRs (31% of participants). About 25% of oral presentations during WGs meetings and the annual conference were delivered by ESRs.. In Training Schools there were 33 ERSs involved (81% of participants)*
- Involvement of researchers from outside of COST Countries. (Number of participants from non-COST Countries approved by the CSO. Give % of such participants from countries with reciprocal agreements. Specify their contribution)
 

*Contrary to the 1<sup>st</sup> year of the Action, in the 2<sup>nd</sup> year of the Action no colleagues from non-COST countries participated in activities of the Action. There is no particular reason for this apart perhaps from the bureaucratic procedures to involve partners from such countries. We foresee that colleagues from such countries will be involved in future activities of the Action. There is an application from Belarus to become an Observer State of the Action. The application is currently under COST Office approval.*
- Advancement and promotion of scientific knowledge through publications and other outreach activities. (Number of publications and other outreach activities that resulted from COST networking through the Action. Complete list should be given in an annex)
  - 1. More than 80 publications have been published or submitted by the Action members (list in Annex II). Seven (7) patents have been awarded to colleagues at of Unilever and their collaborators during the 2<sup>nd</sup> year of the Action (Annex III). Three other pending patents were submitted by PI Drop Technology (McMillan IR). Two patent applications have been*

*submitted by the team in the University of Naples Federico II in 2012, and are currently under evaluation (S. Guido –IT). Two more applications for patents have been submitted by the team in the Aristotle University of Thessaloniki (Karapantsios GR) in 2014 and are also under evaluation Patents submitted for a new liquid atomization technique (Univ. Gratz –AT) and are also under evaluation.*

- 2. The website of the Action has been further improved in order to serve even better as front desk for the external public and for the internal exchange of information (Annex V).*
  - 3. A number of Gender Balance activities have also been implemented (Annex VI) promoting the participation of female members in the Action.*
  - 4. Activities on Commercialisation, IP and related matters have been further developed within WG4. An effort is undertaken to organize an event as a Joint COST Action to deal with these matters. Detailed info is presented in Annex VII.*
- Activities and projects with COST network colleagues.

*Apart from STSMs, there has been also a large number of collaborations among individual Action members on many science aspects of Smart and Green Interfaces (Annex VIII).*

The Thematic Clusters identified during the 1<sup>st</sup> year of activity have been further specified and devoted meetings have been organised to prepare applications related to Smart and Green Interfaces for the incoming H2020 calls. The approach was first proposed during the 1st Annual COST MP1106 Workshop in Dublin, 13-14 September 2012 organizing three Round tables on the topics 1) Food, Biotechnology and Biomedical, 2) Energy and Environmental, 3) NMP: Nanosciences, Nanotechnologies, Materials and new Production Technologies. During the 2nd Annual COST MP1106 Workshop in Prague 21-22 March 2013 16 consortia topics were proposed to be subscribed by action partners. The topics were further refined during the COST MP1106 Workshop in Sofia, 4-5 September 2013, and by intense e-mail and phone conference activity. 19 clusters were initially proposed by consortium partners, some cluster with similar scope were then merged, and 6 clusters were finally selected by the MC 29 November 2013. For each cluster a coordinator was identified. Coordinators are in charge of organizing meetings/discussions and of fostering the setup of consortia for EU Calls of Horizon 2020. Clusters will be specifically allocated a certain budget and number of STSMs. Clusters will be assigned a dedicated budget and a number of STSMs in order to promote discussions and interactions among cluster members and nucleate small groups of Action members, including industrial participation, around proposals to EU calls. The 6 clusters and coordinators are here listed:

- A. Medical Diagnostics and Advanced Therapies, coordinator: Claudio Nastruzzi
- B. Sustainable Food Science and Technology, coordinator: Simeon Stoyanov
- C. Heat and Mass Transfer on a Solid Substrate, coordinators: C.W.M. van der Geld and J.G.M. Kuerten
- D. Wetting of complex surfaces, coordinator: Tatiana Gambaryan-Roisman
- E. Nanomaterials and Nanotechnologies, coordinator: Mustafa Ersoz
- F. Nanostructured Materials for Water Treatment/Purification, coordinator: Vasileios Koutsos

During the 4th Annual Cost MP1106 Workshop in Marseilles, 22-24 april 2014, the first cluster meetings were organized and lead by coordinators, bringing a few ideas around which proposals for the incoming EC calls will be prepared. *A report on Cluster activities can be found in Annex IX.*

- The capacity of the Action members to raise research funds.

*There is a considerable capacity of Action members to raise research funds. For instance, Prof. Moghimi (DK) is currently partnering two large-scale competitive European Commission FP-7 programmes in translational nanomedicine/drug delivery with secured budgets of €11 million and €8.5 million, respectively. In addition, an ERC Starting Grant of 1.5 Million Euro for the period 2012-2017 have been secured by Dr. Drenkhan in the lab of Prof Langevin (FR). Polish partners have attracted approximately 1 Million Euro from their national strategic program on 4 projects (Sosnowski PL).. Netherlands partners participate in 4 STW projects and 1 FOM project with a total*

*budget of 5.0 MEuro (Kuerten, Wijshof, vdGeld NL). UK partner got a EPSRC grant £360k (McHale UK).*

## **II.D. Mid-term Self evaluation**

Self-evaluation of the Action MP 1106 (prepared by Christophe Trabi member of the ESR group)

The ESR group can also be considered as one of the Action main success within the list of others main success. It has been put in place from an early stage and is now particularly active. The ESR participants have their own objectives and expectations from the Action originating from a particular core group of ESR. It can be considered as an investment in the future.

One of the drawback of the Action is the difference in work culture of the participant coming from different countries and background. Some do not know how to bring the output of their research toward a commercial product or they are sometime not encouraged to do so because it is not the main objective of the university or institute they working for. The difference of Institute/Universities as well as individuals' objectives and agenda regarding the commercialisation of research output can be included in the drawback list.

However, it is a key difficulty that there is little confidence that the others understand equally the same problems and have the willingness to work jointly on a common solution. This is more so between academia and industry with industry being reluctant to reveal and discuss critical information even at pre-competitive level.

Another focus for Research Calls of Horizon2020 to focus on, will be the involvement if the ESR group to put their ideas and motivation into words and search for specific calls for this target group as well as organising meetings for ESR group members to discuss specific issues, generating new contacts and provide them with brainstorming session to discuss potential research collaborations.

## **III. Previous scientific report(s)**

### **1<sup>st</sup> year of the Action**

**II. Scientific Report** prepared by the Chair of the Management Committee of the Action, describing results achieved during the Action operation in this period, in no more than 3 pages (the report is "cumulative"). All items listed in Sections A, B, and C, below, must be addressed.

*Additional documentation such as extended scientific reports, proceedings of workshops, seminars or conferences may be provided separately as an annex to this report, and should be referenced in the report.*

## **II.A. Innovative networking**

- Innovative knowledge resulting from COST networking through the Action. (Specific examples of Results vs. Objectives)

Below are some of the projects realized in the frame of WGs that yielded new knowledge. It is a particular feature of the Action that many members participate in several WGs so discrimination per WG is not easy. Due to space limitations only the name(s) of the basic coordinating scientist(s) are mentioned.

1. *Physicochemical and rheological properties of two novel non-conventional biocompatible and biodegradable glycerol ether surfactants* (Karapantsios, GR, Liggieri IT, Dutschk NL)
  2. *Effective methods of aerosol production for novel inhalation therapies. Indicating the influence of aluminosilicate nanoparticles on the surface activity of the lung surfactant (in vitro study related to inhalation toxicology problems). Indicating new approaches to effective powder aerosolization in medical inhalers by converged (focused) and pulsating airflows* (Sosnowski, PL)
  3. *Surfactant Multilamellar Vesicles deformation in flow have been interpreted in terms of the internal microstructure and described on the basis of non-dimensional scaling parameters* (Guido & Caserta, IT)
  4. *Silver nanoparticles (Ag NPs) synthesized by a biochemical reduction method. An aqueous solution of extracted dye from Punica Granatum bark was used as a reducing agent for synthesis silver nanoparticles from silver nitrate. The antibacterial potential of biosynthesized silver nanoparticles against E-coli was examined qualitatively and quantitatively* (Dutschk NL & Šaponjic RS)
  5. *New nano-particle containing adhesives. The addition of nano-particles to the adhesive led to higher fracture energy as well as smaller crack growth rates* (Shanahan FR)
  6. *Wetting of thin cones. A theoretical study of the behaviour of the behaviour of dewdrops on "spindly" leaves with relevance to the production of nano-fibre composites* (Shanahan FR)
  7. *Production of uniform, well dispersed, adhesive TiO<sub>2</sub> surfaces by sputtering that present repetitive antibacterial action under light on polyethylene (PE), polyester (PES) and cotton* (Kiwi, CH).
  8. *Progress in thin film drainage apparatus for foam stability measurement* (Karapantsios, GR, Miller DE)
  9. *Rising bubble experiments with mixed protein/surfactant solutions gave new insight into the formation and composition of dynamic surface layers, leading now to the elaboration of a new theoretical approach on the formation of rear stagnant caps for rising bubbles* (Miller, DE, Malysa PL)
  10. *New insights in the mechanism of bubble bouncing at liquid/gas interfaces.* (Zawala, PL, Caps, BE)
  11. *Indicating the influence of aluminosilicate nanoparticles on the surface activity of the lung surfactant (in vitro study related to inhalation toxicology problems)* (Sosnowski, PL).
  12. *Particulates for stabilizing foams & emulsions; nanotechnology for human health applications* (Navarini, IT).
  13. *Data obtained for the effect of several surfactants on shape oscillations of bubbles and drops. The objective of these data is a possible enlargement of ADSA method for fast information on the interfacial elasticity at very high frequencies* (Vejrazka CZ).
  14. *New method for measuring polymeric time scales by evaluating damped drop shape oscillations. Measured time scale is the deformation retardation time. A way of predicting properties of particles produced by the emulsion extraction method as functions of the parameters of the emulsion formation and extraction kinetics.* (Brenn, AT).
  15. *In continuous laser droplet generation from a metal wire, four different detachment regimes with the corresponding dynamics are identified* (Govekar, SL).
- Significant scientific breakthroughs as part of the COST Action. (Specific examples)
- Scientific results that can be considered as breakthroughs are:

1. *Detection of toxic potential of inhaled dusts by physicochemical assays. Indicating the proper techniques of spraying liposome colloids and cell suspensions for medical purposes (inhalation therapy) (Sosnowski, PL)*
  2. *Cu/TiO<sub>2</sub> supported photocatalysts antibacterial surfaces that use air(O<sub>2</sub>), H<sub>2</sub>O vapor in the air and sunlight to decrease pathogens and avoid the buildup of infectious biofilms (Kiwi, CH)*
  3. *Methodology to characterize non-fluid adsorption layers and resolve the structure of multi-component adsorption layers (Marinova BG, Unilever NL, Kruss DE)*
  4. *Advancement in electrical resistance tomography for measuring gas/liquid fraction in emulsions, foams, two phase dispersed flows (Karapantsios, GR, Gonzalez-Cinca ES)*
  5. *Stem cells that lead to differentiation up to "beating" cardiomyocytes on Organic Field-Effect Transistors (OFET) that can represent a powerful tool for the detection of bio-signals because of their electrically active surface is an organic film (Guido IT).*
- *Tangible medium term socio-economic impacts achieved or expected. (Specific examples)  
At this stage it is too early to predict tangible socio-economic impacts. However, a major part of the commercial and industrial sector with activities in the field of smart and green interfaces as end-users or technology developers is based in Europe. This is manifested by the considerable industrial participation in the Action. The Action is clearly targeted towards applications and this is expected to lead to an economic impact in medium term but it is premature to quantify at present.  
Seven PhD students and nine MS students started their work in the Action teams (Annex I).*
  - *Spin off of new EC RTD Framework Programme proposals/projects. (List)*
    9. *ERC Starting Grant on using the self-organisation of interfacially active agents for the generation of porous solids with physic-chemically well-controlled surface properties (Drenkhan/Langevin FR)*
    10. *Marie Curie EU-ITN multi-partner proposal 'Complex Spread', approved, Kick-off pending (Gambaryan—Roisman DE, Starov UK, Miller DE, Dutschk NL, Karapantsios GR)*
    11. *European Space Agency/ELIPS, FASES-Fundamental and Applied Studies in Emulsion Stability (Liggieri IT, Antoni FR, Miller DE, Karapantsios GR, Dutschk NL)*
    12. *European Space Agency ESA/ELIPS, PASTA PArticle STAbilised Emulsions and Foams (Miller DE, Liggieri IT, Antoni FR, Karapantsios GR, Dutschk NL).*
    13. *OPTIMISED, FP7 BSE-SME Project ID 606506 (Drop Technology IR, Perova IR, Karapantsios GR, Aluivent Zrt. and Femalk Zrt. HU, Ocean Optics NL, Gabrerizo ES, and Gambaryan—Roisman DE; decision not funded.)*
    14. *SCADA-Water, ICT-2013.6.3 ICT for water resource management, (Drop Technology, IR; decision August 2013)*
    15. *ESA/GSTP In-Vivo Embolic Detector (I-VED) Phase IVa (Karapantsios GR, OHB DE)*
    16. *ESA/NPI Bubble dynamics during degassing of liquids (Karapantsios GR).*
    17. *Modelling drying droplets on porous substrates" (Kuersten, Wijshof, vdGeld NL)*
    18. *ManuNet pre-proposal "Enhanced Computer-Aided Process Engineering" submitted; (Peters LU).*
    19. *CORE proposal "LASCOPE (Large Scale Optimisation in Process Engineering)" under preparation (Peters LU).*
    20. *ESA/ELIPS, Project MAP (Colin FR, Legendre FR, Wylock, BE, Haut BE and Colinet BE)*
    21. *EPSRC/EU Call identifier: FP7-NMP-2013-LARGE-7 (Sefiane UK).*
    22. *Preparation of a new ESA/ELIPS project on EVAPORATION involving ULB-TIPs (Colinet BE), UAM-MADIREL (Antoni FR), IUSTI (Tadrist FR, Brutin FR), and TUD (Stephan DE Gambaryan DE), among other teams not part of this COST project.*

23. *Phenomenological studies on COrium COncrete Interaction (COBE), Type of funding scheme: Integrating Collaborative Project, Call identifier: Agence Nationale de la recherche and Commissariat à l'énergie atomique (Antoni FR).*
- Spin off of new National Programme proposals/projects. (List)
    1. *Industrial project: Protein-stabilized foams, (Fairhurst, UK)*
    2. *Industrial project: Shell/FOM concerning DNS of annular mist flow with waves at the liquid film on the wall (Kuerten, vdGeld NL).*
    3. *'Development on nano-based inks for functionalization of textiles' submitted to NWO (The Netherlands organization for Scientific Research) (Dutschk, NL)*
    4. *Proposal submitted to STRATEGMED - national strategic program focused on prevention and therapy of diseases of affluence. The project relates to prevention and therapy of diseases of affluence, and its results should lead to improvement of health and quality of life - passed the first stage of evaluation (Sosnowski, PL)*
    5. *"Influence of the structure of fractal-like aggregates on aerosolization process in complex flow systems" (OPUS-4 program: 2013-15 Polish National Science Centre (NCN) (Sosnowski, PL)*
    6. *Multiphase fluids management in low gravity environment, (Spanish Ministry of Economy and Competitiveness), (Gonzalez-Cinca, ES)*
    7. *"Antibacterial surfaces in hospital tests" project approved by the SNSF in collaboration with the Univ Hospital in Lausanne (CHUV) (Kiwi, CH)*
    8. *Project on multiple emulsions submitted to DFG (Miller, DE).*
    9. *Industrial project : Optimization of the foamscan instrument (Langevin & Teclis, FR)*
    10. *industrial project: High frequency/inkjet drop formation (Katona, RS)*
    11. *Interfacial properties, their diagnostics and their effects on macroscopic flows (research project funded by Ministry of Education, Also, 2 proposals submitted to Czech Science Foundation: Influence of hydrodynamics on size and structure of aggregates formed during coagulation/flocculation process and Investigation of structure-property relationships and breakage dynamics of complex granular materials (Vejrazka CZ)*
    12. *Use of microgravity and hypergravity to study heat and mass transfer during frying, GRAVI-FRYING, submitted to General Secretariat for Research and Technology under the framework of EXCELLENCE II (Karapantsios GR; decision pending)*
    13. *Internal industrial project aimed at investigating food foam structure and sensory properties (Navarini Illy, IT)*
    14. *Industrial project: Procter & Gamble (Starov UK).*
    15. *EPSRC (Starov UK).*
    16. */Micro-MAST (Multiscale Applications of Surface Tension: Microfluidics and Micromanipulation) : Belgian BELSPO-funded PAI network 2012-2017 (partners : ULB-Brussels, ULg-Liège, KUL-Leuven, UMH-Mons, ESPCI-Paris) (Colinet BE).*
    17. *Dielectrowetting: Controlling Oleo- and Hydrophilicity and Shaping Liquid Surfaces, G. McHale (PI), EPSRC EP/K014803/1 (15/7/13-14/7/16). Also, one new national project submitted to EPSRC for consideration (McHale UK).*
    18. *Grants for 2 Ph.D. students to participate in a school (Non-spherical particles and aggregates in fluid flows, Udine), and a conference (Dynamics of active suspensions, gels, cells and tissues, Cambridge) - Investment in ESR development. Also, national project under preparation ( Ekiel-Jezewska PL).*

## **II.B. Inter-disciplinary networking**

- Additional knowledge obtained from working with other disciplines within the COST framework. (Specific examples)

*MP1106 Action is by definition a multi-disciplinary network that acts as a catalyst to pool knowledge, methods and techniques together and enable intellectual and practical exchanges. So responses to this section actually coincide with those at the previous one. Most STSMs have given the applicant to have access to specialized techniques and knowledge not available in the*

host lab. Yet, to discriminate further we present below knowledge gained from collaboration with colleagues outside MP1106.

7. Nano-functionalization of textile materials (MP1106 & CM1101; Dutschk NL & Šaponjic RS)
  8. Adhesive, robust, uniform durable anti-pathogenic surfaces to disinfect hospital rooms, schools, public places decreasing the amount of pathogens through surface photo-switching induced by low intensity solar irradiation or indoors actinic/visible commercial white light (MP1106 & TD906; Kiwi CH)
  9. Inputs from number of other members of COST MP1106 project in chemistry, surface science and instrument engineering as part of EU proposal submissions (McMillan IR).
- Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide scientific impacts. (Specific examples)

*As originally planned, MP1106 Action combines scientists of various expertise and background that bridge the gaps through the scales and across the disciplines in terms of state-of-the-art experimental, theoretical and numerical work. So the level of inter-disciplinarity in the action is more than sufficient to produce scientific impacts. This is reflected to the presented list of new EC RTD Framework Programme proposals/projects where indeed projects involve scientists from different disciplines. For instance, the two projects, Marie Curie EU-ITN 'Complex Spread' and ESA/ELIPS, PASTA PArticle STAbilised Emulsions and Foams involve physicochemists, material scientists, mechanical engineers, chemical engineers, physicists, chemists, biologists, mathematicians etc. Interdisciplinarity is also reflected to many common publications on the results of the first year of the Action activity (Annex II).*
  - Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide socio-economic impacts. (Specific examples)

*As mentioned above, it is too early at this stage to argue about tangible socio-economic impacts. However, MP1106 Action is expected to have in the future appreciable impacts not only as a result of the sufficient inter-disciplinarity of the participating partners but also because of the clear orientation towards applications (industrial, environmental and biomedical). On this account, the last year there have been submitted two European patents applications with PI the Aristotle University of Thessaloniki (Karapantsios GR) and there are also three pending patents with PI Drop Technology (McMillan IR).*

## **II.C. New networking**

- Additional new members joining the Action during its life.

*27 signatory parties (countries) have signed the MoU up to the date of the kick-off meeting. During the first year, Latvia, Switzerland and Lithuania have joined the Action bringing the number of signatory parties to 30. Participation to Working Groups has changed since the beginning of the Action: WG1 from 45 to 42 members (from 27 countries), WG2 from 40 to 79 (from 25 countries), WG3 from 39 to 38 members (from 21 countries), WG4 from 33 to 33 members (from 20 countries). Not registered in WGs: from 62 to 34 members (not involved yet in any activity). Many members participate in more than one WG.*
- Total number of individual participants involved in the Action work. (Number of participants. Give % of female and of Early Stage Researcher participants)

*At the end of the 1<sup>st</sup> year the Action involves 385 individual members from 102 research groups. From them, females are 27% and ESRs are 54%.*
- Involvement of Early Stage Researchers in the Action, in particular with respect to STSMs, networking activities, and Training Schools. In addition, justification should be provided if less than 4 STSMs were carried out during the year.

*From the 10 STSMs of the 1<sup>st</sup> year of the Action, 8 were conducted by ESRs (Annex III). The Action has a high number of ESRs and there is a dedicated ESR Group containing ESRs horizontally from all WGs to help in organizing workshops and training schools/seminars, promoting interaction within the WGs and disseminate post-doc/work placements. Some ESRs are MC members and therefore directly involved in the management of the Action. About 25% of presentations during WGs meetings and the annual conference were delivered by ESRs. A Training School was organized during the 1<sup>st</sup> year of the Action under the title "A way to Smart Europe" The Training School included 12 lectures (from 9 countries), 2 laboratory visits and 3 interactive Workshops. The aim was to creatively address the challenge of transforming ideas from polymer and bio/nano research into industrial applications. 23 ESRs (postdocs, PhD students and MS students) from 13 countries attended the Training School under reimbursement from MP1106 Action.*

- Involvement of researchers from outside of COST Countries. (Number of participants from non-COST Countries approved by the CSO. Give % of such participants from countries with reciprocal agreements. Specify their contribution)  
*Five institutions from NON-COST countries have participated in the Action meetings. They were from Australia (1), New Zealand(1), USA(1) and Canada(2). In addition, there was also a researcher invited as external expert from Russia (Neighbouring COST countries). Colleagues from Australia and New Zealand were financially covered by Reciprocal Agreements which corresponds to 2/6, i.e., 33%. These experts are prominent scientists in the field of interfacial phenomena and two phase flow and have communicated the state-of-the-art in the field experimentally and theoretically. Two of these experts have given keynote lectures during the annual conference.*
- Advancement and promotion of scientific knowledge through publications and other outreach activities. (Number of publications and other outreach activities that resulted from COST networking through the Action. Complete list should be given in an annex)  
*More than 30 publications have been published or submitted by the Action members (list in Annex II).  
Two European patents applications have been submitted by the team in the Aristotle University of Thessaloniki (Karapantsios GR) and there are also three other pending patents submitted by PI Drop Technology (McMillan IR).  
During the first year of the network, an active website for exchange of information and for making public the action activity has been created (Annex IV).  
A number of Gender Balance activities have also been implemented (Annex V) promoting the participation of female members in the Action.  
Under the responsibility of WG4 a survey was conducted of all the partners of the Action on their views and activities on Commercialisation, IP and related matters . The results are summarized in Annex VI.*
- Activities and projects with COST network colleagues.  
*Apart from STSMs, there has been also a large number of collaborations among individual Action members on many science aspects of Smart and Green Interfaces (Annex VII).  
At the 1<sup>st</sup> annual conference of the Action three Round Tables were organized on specific thematic areas of high significance: a) Food, Biotechnology and Biomedical Applications b) Nanotechnology & Nanoscience and c) Energy and Environment. In these Round Tables it was decided to establish interdisciplinary clusters of members on specific topics with emphasis to applications. These clusters will be given the freedom to organize meetings in order to discuss science matters and coordinate efforts towards submitting proposals to forthcoming EU Research Calls. A report of the results of the Round Tables can be found in Annex VIII.  
Further to the above, a series of other activities have been organized by members during the 1<sup>st</sup> year of the Action:*
  1. *Workshop on Materials and Processes for Energy Applications jointly with COST actions: MP1004, MP1103*
  2. *Workshop: Inkjet Printing on textiles: Nanos and electronics(Dutschk, NL)*



3. *A platform is being created where industries could find help for measurements/projects related to bubbles and drops (Langevin, FR)*
  4. *Workshop on wetting on complex systems in Marseille (Fairhurst UK, Brutin FR).*
  5. *Advanced school on "Fluid foam physics" to be held 3-9 November 2013 in Orsay, France (involved project partners: Langevin FR, Drenckhan FR, Denkov BG).*
- *The capacity of the Action members to raise research funds. For instance, Prof. Moghimi (DK) is currently partnering two large-scale competitive European Commission FP-7 programmes in translational nanomedicine/drug delivery with secured budgets of €11 million and €8.5 million, respectively. In addition, an ERC Starting Grant of 1.5 Million Euro for the period 2012-2017 have been secured by Dr. Drenckhan in the lab of Prof Langevin (FR). Polish partners have attracted approximately 1 Million Euro from their national strategic program on 4 projects (Sosnowski PL).. Netherlands partners participate in 4 STW projects and 1 FOM project with a total budget of 5.0 MEuro (Kuerten, Wijshof, vdGeld NL). UK partner got a EPSRC grant £360k (McHale UK).*

## Annex I

### **New PhD/Master students in the topic of this COST action for the 2<sup>nd</sup> year of the Action**

1. Francesca Cirisano (PhD on Advanced Hydrophobic Coatings for Marine Applications) (M. Ferrari, IT)
2. R. D'Apolito (PhD since March 2013 on microfluidic interaction between Red Blood Cells and microdrug carriers) (Guido, IT)
3. M. Vlachou (PhD student since June Sept 2013 on flow boiling) (Karapantsios GR)
4. O. Oikonomidou (PhD student since Sept 2013 on flow degassing) (Karapantsios GR)
5. R. Liuzzi (PhD since March 2014 on microstructured systems for bioengineering applications) (Guido, IT).
6. A. Carciati (PhD since March 2014 on microfluidics of biological systems) (Guido, IT).
7. A new PhD student, 4 new MSc students, (Sosnowski, PL)
8. A. Mesimeris (MSc student since June 2013 on bubble detection during decompression sickness) (Karapantsios GR)
9. C. Argiropoulos ( MSc student since June 2013: CFD estimation of heat transfer in narrow channels) (Karapantsios GR)
10. A. Plomaritis (MSc student since June 2013: Thermal conductivity of composite polymeric materials) (Kostoglou GR)
11. M. Aprea (MS in 2014 on Drying in porous media) (Guido, IT)
12. D. Musino (MS in 2014 on nanoemulsification in microfluidic flow) (Caserta, IT)
13. P. Tirocinio (MS in 2013 on interaction between Red blood cells and drug microparticles in microconfined flow) (Guido & Caserta, IT)
14. L. Falanga (MS in 2014 on catalytic synthesis in continuous microreactor) (Guido, IT)
15. L. Sicignano (MS in 2014 on catalytic synthesis in continuous microreactor) (Guido, IT)
16. A. Prato (MS since 2014 on development of microfluidic biosensors) (Guido & Caserta, IT)
17. G. Merano (MS since 2014 on upstream of waxy crude oil emulsions) (Caserta, IT)
18. N. Di Mauro (MS since 2014 on dissolution of complex fluids) (Guido & Caserta, IT)

### **PhD/Master students in the topic of this COST action for the 1<sup>st</sup> year of the Action**

1. E. Georgiou (MS student: developments on thin film drainage) (Karapantsios GR)
2. Jooyoung Won (PhD on drop/bubble coalescence) (Miller DE)
3. Narges Moradi (MS on protein conformational changes at interfaces) (Miller DE)
4. Marzieh Lotfi (PhD on simulations of rising bubbles in surfactant solutions) (Miller DE)
5. Vamsee Ulaganathan (PhD on molecular foam fractionation) (Miller DE)
6. Inga Retzlaff (MS on protein stabilized foam films) (Miller DE)
7. One PhD student and three master students joined the group since the start of the Action (Gonzalez-Cinca ES)
8. One new PhD student since February 2013 (Marinova BG)
9. Alexander Kuznetsov (PhD on characterization and stabilization of laser droplet generation process) ( Govekar SL).
10. One PhD student and 3 M.Eng students on smart and green instrumentation (McMillan & Kennedy IR)

**Annex II**  
**List of publications during the 2nd year of the Action**

1. D. Zabiegaj, E. Santini, E. Guzmán, M. Ferrari, L. Liggieri, V. Buscaglia, M. T. Buscaglia, G. Battilana, F. Ravera. Nanoparticle laden interfacial layers and application to foams and solid foams, *Colloids Surfaces A: Physicochem. Eng. Aspects* 438 (2013) 132–140
2. A. Javadi, J. Krägel, M. Karbaschi, J.Y. Won, A. Dan, G. Gochev, A.V. Makievski, G. Loglio, L. Liggieri, F. Ravera, N.M. Kovalchuk, M. Lotfi, V. Ulaganathan, V.I. Kovalchuk and R. Miller, Capillary pressure experiments with single drops, in “Progress in Colloid Interface Science”, Vol. 4, P. Kralchevsky, R. Miller and F. Ravera (Eds.), 2013, 271-312.
3. E. Guzman, E. Santini, L. Liggieri, F. Ravera, G. Loglio J. Krägel, A. Maestro, R.G. Rubio, D. Grigoriev and R. Miller, Particle-surfactant interaction at liquid interfaces, in “Progress in Colloid Interface Science”, Vol. 4, P. Kralchevsky, R. Miller and F. Ravera (Eds.), 2013, 77-109.
4. E. Santini, E. Guzmán, M. Ferrari, L. Liggieri, Emulsions stabilized by the interaction of silica nanoparticles and palmitic acid at the water–hexane interface. *Colloids and Surfaces A: Physicochem. Eng. Aspects*. 2014 In press. <http://dx.doi.org/10.1016/j.colsurfa.2014.02.054>
5. A. Javadi, N. Mucic, M. Karbaschi, J.Y. Won, M. Lotfi, A. Dan, V. Ulaganathan, G. Gochev, A.V. Makievski, V.I. Kovalchuk, N.M. Kovalchuk, J. Krägel and R. Miller, Characterization methods for liquid interfacial layers, *Eur. Phys. J. Special Topics* 222 (2013) 7–29.
6. A. Dan, R. Wüstneck, J. Krägel, E.V. Aksenenko, V.B. Fainerman and R. Miller, Adsorption and Dilational Rheology of Mixed  $\beta$ -Casein/DoTAB Layers Formed by Sequential and Simultaneous Adsorption at the Water/Hexane Interface, *Langmuir*, 29 (2013) 2233–2241.
7. A. Dan, R. Wüstneck, J. Krägel, E.V. Aksenenko, V.B. Fainerman and R. Miller, Adsorption and Dilational Rheology of Mixed  $\beta$ -Casein/DoTAB Layers Formed by Sequential and Simultaneous Adsorption at the Water/Hexane Interface, *Langmuir*, 29 (2013) 2233–2241.
8. A. Dan, G. Gochev, J. Krägel, E.V. Aksenenko, V.B. Fainerman and R. Miller, Interfacial rheology of mixed layers of food proteins and surfactants, *COCIS*, 18 (2013) 302–310
9. V.B. Fainerman, E.V. Aksenenko, J. Krägel and R. Miller, Viscoelasticity moduli of aqueous C14EO8 solutions as studied by drop and bubble shape methods, *Langmuir*, 29 (2013) 6964 - 6968.
10. V.B. Fainerman, N. Mucic, V. Pradines, E.V. Aksenenko and R. Miller, Adsorption of alkyltrimethylammonium bromides at water/alkane interfaces – competitive adsorption of alkanes and surfactants, *Langmuir*, 29 (2013) 783–789.
11. Sosnowski T.R. Nanosized and nanostructured particles in pulmonary drug delivery. *J. Nanosci. Nanotechnol.* – accepted (full paper – invited review)
12. Sosnowski T.R., Kurowska A., Butruk B. Jabłczyńska K. (2013). Spraying of cell colloids in medical atomizers, *AIDIC Conference Series* 11, 371-380. (full paper - DOI:10.3303/ACOS1311038)
13. Sosnowski T.R., Kurowska A., Butruk B. Jabłczyńska K. (2013). Spraying of cell colloids in medical atomizers, *Chem. Eng. Transact.* 32, 2013, 2257-2262. (full paper - DOI: 10.3303/CET332377)
14. Sosnowski T.R., Kurowska A., Butruk B. (2013). Atomization of living cells from aqueous suspensions, *J. Aerosol Med Pulm. Drug. Del.* 26(2), A40-A41 (abstract)
15. Sosnowski T.R., Jabłczyńska K. (2013). Aerosol droplet size in the pulsed jet nebulization, *J. Aerosol Med Pulm. Drug. Del.* 26(2), 2013, A41 (abstract)
16. Kramek-Romanowska K., Sosnowski T.R. (2013). Dynamic interactions of selected mineral nanoparticles with the pulmonary surfactant at the air/water interface. Abstracts of COST MP1106 Annual Meeting, Prague, 21-22.03.2013. p. 60 (abstract)
17. J. Zawala, S. Dorbolo, N. Vandewalle, K. Malysa, “Bubble bouncing at clean water surface”, *Phys. Chem.*

18. J. Zawala, E. Malysa, M. Krzan, K. Malysa, "Monitoring of contamination of environmental and coal processing plants waters using the bubble velocity measurements – advantages and limitations", *Physicochem. Probl. Miner. Process.*, 50(1) (2014) 143–157
19. D. Kosior, J. Zawala, R. Todorov, D. Exerowa, K. Malysa, „Bubble bouncing and stability of liquid films formed under dynamic and static conditions from n-octanol solutions”, *Colloids & Surfaces A*; <http://dx.doi.org/10.1016/j.colsurfa.2013.11.022>
20. J. Zawala, D. Kosior, K. Malysa, "Air-assisted bubble immobilization at hydrophilic porous surface", *Surface Innovations*, doi: 10.1680/si.13.00031
21. Wylock, S. Dehaeck, D.A. Quintans, P. Colinet and B. Haut, "CO<sub>2</sub> absorption in aqueous solutions of N-(2-hydroxyethyl)piperazine: experimental characterization using interferometry and modeling", *Chem. Eng. Sci.* 100, 249-258 (2013); doi: 10.1016/j.ces.2013.02.068.
22. Rednikov and P. Colinet, "Singularity-free description of moving contact lines for volatile liquids", *Phys. Rev. E* 87, 010401(R) (2013).
23. Lioumbas, J.S., Chatzidafni, A. & Karapantsios, T.D. "Spatial Considerations on Electrical Resistance Tomography Measurements", *Measurement Science and Technology*, in press.
24. Lioumbas, J.S., Zamanis, A. & Karapantsios, T.D. 2013, "Towards a wicking rapid test for rejection assessment of reused fried oils: Results and analysis for extra virgin olive oil", *Journal of Food Engineering*, 119, pp. 260-270.
25. Kosior D., Zawala J., Todorov R., Exerowa D., Malysa K., Bubble bouncing and stability of liquid films formed under dynamic and static conditions from n-octanol solutions, *Colloids and Surfaces A* , 2013, (in press) DOI:10.1016/j.colsurfa.2013.11.022
26. Dimi Arabadzhieva, Plamen Tchoukov, Borislav Soklev, Elena Mileva, Interfacial layer properties and foam film drainage kinetics of aqueous solutions of hexadecyltrimethylammonium chloride, *Colloids and Surfaces A*, 2014, accepted.
27. A. Y. Gyurova, S. V. Stoyanov, E. Mileva, Interaction of four-antennary oligoglycines and lipopolysaccharides in aqueous media, *Colloids and Surfaces A*, 2014, in press.
28. Terziyski I., Alexandrova L., Stoineva I., Christova N., Todorov R., Cohen R., Foam and wetting films from rhamnolipids produced by *Pseudomonas aeruginosa* BN10, *Colloids and Surfaces A*, 2013, (in press)DOI:10.1016/j.colsurfa.2013.12.075
29. Hristina Petkova, Khristo Khristov, Dochi Exerowa, Critical capillary pressure: a parameter for evaluation thinliquid film stability, *Comptes Rendus de L'Academie Bulgare des Sciences*, 2014, in press
30. S Rtimi, C Pulgarin, R Sanjines, J Kiwi, Innovative photo-switchable behavior by uniform, semi-transparent thin films leading to the reduction of environmental contamination under light, *RSC Advances* 3 (2013) 16345-16349.
31. S Rtimi, C Pulgarin, O Baghriche, J Kiwi, Accelerated bacterial inactivation obtained by HIPIMS sputtered films deposited on surfaces with concomitant reduction in the metal/semiconductor content, *RSC Advances* 3 (2013) 13127-13130.
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34. J Kiwi, S Rtimi, C Pulgarin, Chapter 'Cu, Cu/TiO<sub>2</sub> thin films sputtered by up to date methods on non-thermal thin resistant substrates leading to bacterial inactivation' v1, p.74-82, 2013 in: Book: 'Microbial pathogens and strategies for combating them: science, technology and education: Editor: A. Méndez-

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35. S Rtimi, O Baghriche, C Pulgarin, A Ehasarian, R Bandorf, J Kiwi, Comparison of the performance HIPIMS sputtered Ag- and Cu-surfaces leading to accelerated bacterial inactivation in the dark, *Surf. & Coat. Technol.*, accepted.
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37. S Rtimi, O Baghriche, C Pulgarin, R Sanjines, J-C Lavanchy, J Kiwi, Uniform In<sub>2</sub>O<sub>3</sub>/TiO<sub>2</sub> Films Effective in Bacterial Inactivation Under Low Intensity Solar Irradiation, *Photochem. Photobiol. A*, accepted.
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40. J Borovička, SD Stoyanov, VN Paunov, Shape and size recognition of microbial cells by colloidal cell imprints, *Nanoscale* 5 (2013) 8560 - 8568.
41. W Small, SD Stoyanov, VN Paunov, Scaffold Free Fabrication of Linear Multicellular Assemblies by Dielectrophoretic Hydrogel Trapping Technique, *Biomaterial Science* 1 (2013) 996 – 1002.
42. SA Hamad, SD Stoyanov, VN Paunov, Triggered Cell Release from Shellac-Cells Composite Microcapsules, *MRS Proceedings*, 1498, 2013.
43. K Golemanov, S Tcholakova, N Denkov, E Pelan, SD Stoyanov, Remarkably high surface visco-elasticity of adsorption layers of triterpenoid saponins, *Soft Matter* 9 (2013) 5738.
44. RD Stanimirova, ThD Gurkov, KT Balashev, PA Kralchevsky, SD Stoyanov, E Pelan, Surface Pressure and Elasticity of Hydrophobin HFBII Layers on the Air-Water Interface: Rheology vs. Structure Detected by AFM Imaging, *Langmuir* 29 (2013) 6053–6067.
45. SA Hamad, AKF Dyab, SD Stoyanov, VN Paunov, Sporopollenin microcapsules for microencapsulation of living cells, *MRS Proceedings*, 1499, mrsf12-1499-n05-181, 2013.
46. J Borovicka, W Metheringham, L Madden C Walton, SD Simeon, V Paunov, Photothermal Colloid Antibodies for Shape Selective Recognition and Killing of Microorganisms, *JACS* 135 (2013) 5282–5285.
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48. TBJ Blijdenstein, R Ganzevles, PWN de Groot, SD Stoyanov, On the link between Surface Rheology and Foam Disproportionation in mixed Hydrophobin HFBII and whey protein systems, *Colloids and Surfaces A: Physicochem. Eng. Aspects* 438 (2013) 13-20.
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50. SA Hamad, SD Stoyanov, VN Paunov, Kinetics of triggered release of cells from composite microcapsules, *Phys. Chem. Chem. Phys.* 15 (2013) 2337 - 2344.
51. TR Sosnowski, Nanosized and nanostructured particles in pulmonary drug delivery, *J. Nanosci. Nanotechnol.* accepted (full paper – invited review).
52. TR Sosnowski, A Kurowska, B Butruk, K Jabczyńska, Spraying of cell colloids in medical atomizers, *AIDIC Conference Series* 11 (2013) 371-380. (full paper - DOI:10.3303/ACOS1311038).
53. TR Sosnowski, A Kurowska, B Butruk, K Jabczyńska, Spraying of cell colloids in medical atomizers,

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54. TR Sosnowski, A Kurowska, B Butruk, Atomization of living cells from aqueous suspensions, *J. Aerosol Med Pulm. Drug. Del.* 26 (2013) A40-A41 (abstract).
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57. I Malavasi, I Bernagozzi, C Antonini, M Marengo, Towards a Standard Protocol to Assess Durability of Superhydrophobic Surfaces, submitted to *Surface Innovations*.
58. G Trefalt, I Szilágyi, M Borkovec, Poisson-Boltzmann description of interaction forces and aggregation rates involving charged colloidal particles in asymmetric electrolytes, *Journal of Colloid and Interface Science* 406 (2013) 111.
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75. M Nasiriboroumand, M Montazer, J Liesiene, Z Šaponic, V Dutschk (2013) Novel method for synthesis and application of silver nanoparticles on wool. In: 17th Conference European Colloid and Interface Society, September 1 – 6, Sofia, Bulgaria, 01-09-2013 - 06-09-2013, Sofia, Bulgaria.
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82. G. Tomaiuolo, G. Rusciano, S. Caserta, A. Carciati, V. Carnovale, P. Abete, A. Sasso and S. Guido, "A new method to improve the clinical evaluation of Cystic Fibrosis patients by mucus viscoelastic properties", *PLOS ONE* January 2014, 9 (1), e82297.
83. F. Ascione, S. Caserta, R. Perris, S. Guido. "Investigation of Cell Dynamics in vitro by Time Lapse Microscopy and Image Analysis", *Chemical Engineering Transactions*, 38, 2014, p. 517-522.
84. L. Lanotte, G. Tomaiuolo, C. Misbah, L. Bureau, S. Guido. "Red blood cell dynamics in polymer brush-coated microcapillaries: A model of endothelia glycocalyx in vitro", *Biomicrofluidics*, 8, 014104, 2014.

#### **List of publications during the 1<sup>st</sup> year of the Action**

1. C.D. Ampatzidis, E-M.A. Varka, T.D. Karapantsios, 2013 Dynamic surface properties of eco-friendly phenylalanine glycerol ether surfactants at the W/A interface, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, In Press.
2. C.D. Ampatzidis, E-M.A. Varka, T.D. Karapantsios, 2013 Adsorption behavior of non-conventional eco-friendly tyrosine glycerol ether surfactants, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, In Press.
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5. Sosnowski TR, Kurowska A., Butruk B. (2013). Atomization of living cells from aqueous suspensions. *J. Aerosol Med Pulm. Drug. Del.* 26(2): A40-A41 (ISAM Congress abstract)
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9. S. Arias and R. González-Cinca, *Chemical Engineering Science* 91, 5 (2013).
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13. Evidence for TiON sputtered surfaces showing accelerated antibacterial activity under solar irradiation Sami Rtimi, Cesar Pulgarin, Michael Bensimon, John Kiwi, *Solar En.*, 2013, 93, 55-62.
14. Accelerated bacterial inactivation obtained by HIPIMS sputtered films deposited on surfaces with concomitant reduction in the metal/semiconductor content. Sami Rtimi, Cesar Pulgarin, Oualid Baghriche and John Kiwi, *RSC Advances*, accepted
15. TaON and TaON/Ag co-sputtered surfaces under visible light irradiation leading to E. coli interfacial charge transfer (IFTC) implications. S. Rtimi, C. Pulgarin, R. Sanjines, J-C. Lavanchy, J. Kiwi, *J. Hazardous Mat*, accepted
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17. V.B. Fainerman, S.V. Lylyk, N.M. Kovalchuk, V.I. Kovalchuk, E.V. Aksenenko, J.T. Petkov and R. Miller, Effect of water hardness on surface tension and dilational visco-elasticity of sodium dodecyl sulphate solutions, *J. Colloid Interface Sci.*, 377 (2012) 1–6.
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19. E. Guzman, E. Santini, L. Liggieri, F. Ravera, G. Loglio J. Krägel, A. Maestro, R.G. Rubio, D. Grigoriev and R. Miller, Particle-surfactant interaction at liquid interfaces, in "Progress in Colloid Interface Science", Vol. 4, P. Kralchevsky, R. Miller and F. Ravera (Eds.), 2013, Chapter 4, p. 77-109.
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### **Annex III**

#### **List of patents during the 2nd year of the Action**

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**Annex IV**  
**List of STSM during the 2<sup>nd</sup> year of the MP1106 Action**

<b>Name</b>	<b>Sending Institute</b>	<b>Host Institute</b>	<b>Title</b>	<b>Time</b>		<b>Budget, €</b>	<b>Results</b>
Ms Marceta Brankica	University of Serbia Novi Sad	Faculty for Engineering Technology University of Twente, Enschede, Netherlands	Characterization of w/o adsorption layers composed of oil soluble emulsifiers and vegetable fats	2013-07-01	2013-08-09	2400.00	Completed
Dr Antonio Perazzo	University of Naples Federico II	Max-Planck-Institut für Kolloid-und Grenzflächenforschung Potsdam Germany	Interfacial tensiometry by pendant drop technique	2013-07-22	2013-08-23	2300.00	Completed
Mr Alexandros Askounis	Edinburgh University	School of Chemistry, Aristotle University of Thessaloniki Thessaloniki Greece	Exchange of expertise in the field of green interfaces of bubbles and drops.	2013-07-22	2013-07-29	800.00	Completed
Ms Leonor Perez Fuentes	University of Granada	Centre de Recherche Paul Pascal - CNRS (Université Bordeaux) Pessac France	onic Specificity in Colloidal Interfaces: A Study Experimental, Theoretical and by Simulations	2013-09-16	2013-12-16	2400.00	Completed
Mr Miguel Ángel Fernández Rodríguez	University of Granada	ETH Zürich - Eidgenössische Technische Hochschule Zürich Zürich Switzerland	Synthesis and characterization of 2D particle arrays of Janus nanoparticles at interfaces	2013-09-23	2013-12-23	3500.00	Completed
Ms Virginie Papadopoulou	Imperial College London & Haute Ecole Paul Henri Spaak	Aristotle University, Department of Chemistry, Thessaloniki, Greece Thessaloniki Greece	Modelling decompression induced bubble growth, role of viscosity and ex-vivo tissue surface	2013-10-06	2013-10-27	2000.00	Completed
Ms Zuzana Brabcova	ICT Prague	Aristotle University of Thessaloniki Thessaloniki Greece	Collision and attachment of particles on bubbles in flotation systems	2013-10-14	2014-02-07	3500.00	Completed
Dr Christophe Wylock	-FNRS postdoctoral researcher at Université Libre de Bruxelles	Institut de Mécanique des Fluides de Toulouse (IMFT) Toulouse France	Growth of a vapor bubble in presence of an absorbed gas	2013-10-20	2013-10-26	800.00	Completed

Name	Sending Institute	Host Institute	Title	Time	Budget, €	Results
Mr Federico Quinci	University of Southampton	Dept. Life Sciences and Biotechnology, University of Ferrara Ferrara Italy	CHARACTERIZATION AND COMPUTATIONAL MODELLING OF NANO-MICORPARTICLES PRODUCED BY MICROFLUIDICS	2013-11-07    2013-12-07	2100.00	Completed
Dr Alexander Kartushinsky	Tallinn University of Technology	University of Technology Eindhoven Netherlands	COST MP1106-13755	2014-01-06    2014-01-10	850.00	Completed
Mr Vamseekrishna Ulaganathan	MPI of Colloids and Interfaces, Potsdam, Germany	CNR-IENI Genoa Italy	Sea-Water Pullutants Detection by Rising Bubble Devices	2014-04-22    2014-05-05	900.00	Completed
Mr Christopher Hamlett	Nottingham Trent Unversity, UK	Laboratoire de Physique des Solides, Universit� Paris Sud Paris France	Dilational elasticity of protein films: The effect of foam boosters and breakers	2014-05-12    2014-05-23	1480.00	Completed
<b>Total</b>	<b>12</b>				<b>22950</b>	

### List of STSM during the 1st year of the MP1106 Action

Name	Sending Institute	Host Institute	Title	Time	Budget, €	Results
Ms Virginie Papadopoulou	Imperial College London,London UK	Aristotle University of Thessaloniki,Thessaloniki, Greece	Investigation of bubble formation and growth on tissues during decompression	03.11.2012 to 21.12.2012	1.500	Completed
Ms Lucie Vobecka	Institute of Chemical Process Fundamentals, Czech republic	Max Planck Institute of Colloids and Interfaces,Postdam(DE),	Measurements of interfacial properties of terpeneol solution	02.12.2012 to 14.12.2012	1.190	Completed
Dr Jürgen Krägel	Max Planck Institute of Colloids and Interfaces,Potsdam-Golm(DE)	Universite Paul Cesanne d' Aix Marseille III,Marseille(FR),	Tomographic microscopy of emulsions	06.01.2013 to 20.01.2013	1.500	Completed
Mr Mohsen Karbaschi	Max Planck Institute of Colloids and Interfaces,Potsdam-Golm(DE)	Statoil ASA,Porsgrunn,Porsgrunn(NO ),	Droplet coalescence in Oil-Water systems, concentrated emulsions and instabilities	07.12.2012 to 31.01.2013	2.500	Completed
Dr Marcel Krzan	Jerzy Haber Institute of Catalysis and Surface Chemistry,Cracow (PL)	GRASP Group for Research and Application in Statistical Physics, Institut de Physique, Liege Univ. BE	Foamability of bio-surfactants based foams	09.01.2013 to 02.02.2013	2.200	Completed
Ms Maria Vlachou	Aristotle University of Thessaloniki,Thessaloniki(EL )	Technische Universität Darmstadt,Darmstadt(DE),	Determination of critical parameters of flow boiling	20.01.2013 to 26.01.2013	900	Completed
Dr Viorel Vasile Nastasa	National Institute for Laser Plasma and Radiation Physics,Magurele(RO)	Aristotle University of Thessaloniki, Department of Chemistry, Technology, Thessaloniki(EL)	Studies on the generation and stability of foams containing Polydocanol	31.03.2013 to 28.04.2013	2.250	Completed
Ms Agota Simon	National Institute for Laser Plasma and Radiation Physics,Magurele(RO)	Engineering for Smart Materials, Faculty of Engineering Technology, Enschede, NL	The interaction of solutions with medicine exposed to laser radiation with different surfaces	28.04.2013 to 26.05.2013	2.200	Completed
Dr Cornelis van der Geld	Eindhoven University of Technology,Eindhoven(NL)	Institute of Chemical Process Fundamentals,Prague(CZ),	Bubble shape oscillations of pinned bubbles	28.04.2013 to 10.05.2013	1300	Completed
Dr Konstantinos Samaras	Aristotle University of Thessaloniki,Thessaloniki(EL )	Univeristy of Thessaly,Volos(EL),	Measurement techniques of two-phase flow characteristics in pipes	13.05.2013 to 31.05.2013	1.500	Completed
<b>Total</b>	<b>10</b>				<b>17040</b>	

## **Annex V**

### **Dissemination Report for the 2<sup>nd</sup> year of the Action**

The Dissemination manager Prof. Nikolai Denkov suggested that the dissemination activity is realized mostly via publications (including reviews in the specialized journal Adv. Colloid Interface Science on the research activity of the action) and via the website of the action. The information submitted for website loading is handled promptly (within 1 to several days). Messages to all action participants are regularly sent without any delays. Information about all meetings (past and coming) is uploaded. One minor problem with the website is that most of the fresh information appears on the second-level pages (e.g. on page Events) without warning on the main page. Following a suggestion by Prof. L. Liggieri, it was decided that all new messages will be briefly announced on the main page of the project with their date of appearance.

### **Dissemination Report for the 1<sup>st</sup> year of the Action**

During the first year of the network, an active website for exchange of information and for making public the action activity has been created – see the address:

<http://cost-mp1106.lcpe.uni-sofia.bg/>

This site contains a brief description of MP1106 scope, link to the detailed presentation of the action aims, structure, research and application areas, and sub-domains for:

- Management Committee (list with complete information and e-mail addresses)
- Participants (complete list by countries)
- Workgroups (lists of members, with WG leaders and their e-mail addresses)
- Events (separated for each year with links to the specific event activities and information)
- Jobs (with description)
- Publications by the action participants (with links to the original papers)
- Core Group members with their contacts

The information on the web-site is updated very regularly, with the Minutes of all meetings of the MC being included, along with all important presentations of the various meetings and other relevant information. The time between the request for uploading given new information and its appearance on the web-site is several days (in most cases 1-2 days).

In addition, a system of distribution of messages to all participants in the action was created and used regularly to send information about the forthcoming events and about open positions in the participating institutions. The system is convenient, because anyone could send a message to the e-mail address:

[cost-mp1106@lists.dce.uni-sofia.bg](mailto:cost-mp1106@lists.dce.uni-sofia.bg).

After approval by the Dissemination manager, this message is distributed to the participants and the replies are received by the sender of the message, thus ensuring direct contact between the interested partners.

All suggestions for changes in the web-site have been discussed and all requests that found support by the Core Group members so far have been implemented.

N. Denkov, Dissemination Manager

## **Annex VI**

### **Gender Balance Activities Report for the 2<sup>nd</sup> year of the Action**

In the framework of gender balance measures a competition for the design of Action's logo has been announced in June 2013. The jury consisted of the members of a core group. The winner of the competition was Prof. Claudio Nastruzzi (Università degli Studi di Ferrara). The winner has received a valuable present during the dinner of the COST MP1106 Annual Meeting 2014, Marseille.

During the Annual Meeting in Marseille April 2014, several discussions have been lead with Early Stage Researchers, focusing on the female researchers. It has been suggested that special training on gender balance issues will be included into the planned Training Schools and possible special mentoring program will be started. These measures will be further discussed in cooperation with the ESR group.

### **Gender Balance Activities Report for the 1<sup>st</sup> year of the Action**

The memorandum of understanding contains a clear statement concerning promotion of gender balance in the framework of the COST Action MP1106: „This COST Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its MC agendas.” The following measures have been planned:

1. “All of the groups of the Action will be encouraged to promote the involvement of female professionals during the following activities: (i) selection of new research recruits (e.g. by hiring female undergraduate students), (ii) selection of personnel for short-term scientific missions, (iii) selection of personnel to attend scientific conferences”. This measure has been successfully fulfilled. 22% of the Action Working Groups are females. 34% of the Early Stage Researchers are female. 22.4% female participation at STSMs has been reached.
2. “Female participants will be encouraged to take part to the MC and lead the WGs”. 23% of MC members are female. Prof. Victoria Dutschk (The Netherlands) leads WG2.
3. “Facilitate participation of females to attend the Action conference/workshops and training schools. For instance, preference for hosts with available children care will be adopted to facilitate participation of mothers accompanied by children”. The action conferences and workshops which took place in the reporting period were attended by a large number of female scientists. The exact percentage of female representatives is unavailable.

T. Gambaryan-Roisman, Gender Balance Coordinator

## Annex VII

### Activities on Commercialization, IP and related matters in the 2<sup>nd</sup> year of the Action

Joint COST Action Workshop/Symposium/Publications

By Norman McMillan and Victor Acinas

#### Overview

- The purpose of the activity is to bring together leaders in nanoscience and nanotechnology research, business and European state agencies and pan-European organisations with business academics to explore important commercialisation and collaboration issues that are being identified for the first time from three important nano-COST Actions (NOTE ! on Note page below).
- The Activity is to deliver (i) new research work and publications on these key (NOTE 2) commercialisation and collaboration issues led by experienced Nano-commercialisation state personnel to draw together in a novel structured meeting (ii) draw together a representative group of nano: researchers; business people; state agencies; European bodies; and exemplars of nano-commercialisation in structured evolving workshop discussions to collectively deliver new visions on important emerging problems (iii) new structures potentially to help the COST Actions advance their commercialisation and IP objectives (iv) new visions on trans-COST approaches focussed on the individual (NOTE 3)
- Participants will obtain a overarching knowledge of commercialisation and IP issues that will help shape their personal understanding of a range of issues that for the first time will be publically identified and debated with the ambition that these will help them to get to the cutting edge of commercialisation and IP
- Technical Overview provided by joint Review Article for peer reviewed journal Measurement Science & Technology (IOPP, Bristol) with three contributory sections from MP1102; MP1106 and MP1302 This article will be included in front of Workshop programme and published before the date of this joint COST activity.

#### Brainstorming Objectives

- Objectives of Day 2 and 3 Workshops:
  - Day 2: Sessions led by three COST Actions to explore new issues related to their Action. These issues will be debated in a forum with chairs drawn from those that led sessions in Day 1 to ensure experience transferred from Day 1.
  - Day 3: Joint Session with Exemplars of NanoCommercialisation leading all three



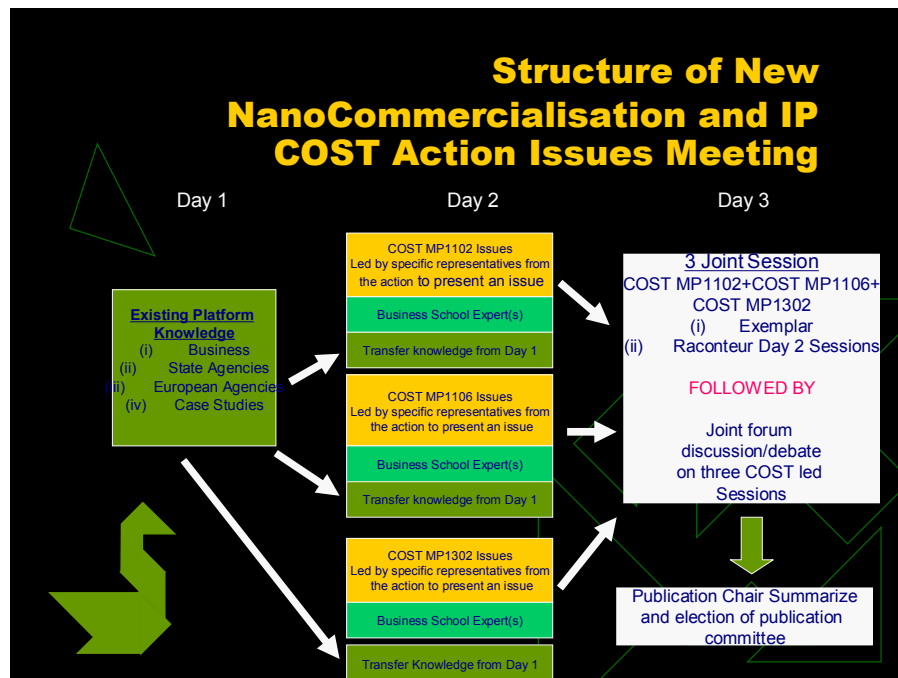
sessions to lead-out the discussion on report from three Chairs of Day 2 sessions. The Raconteur of the Day 2 meeting will present a report and Chair will summarize the conclusions from the session drawing also on the contribution from Exemplar. The three sessions of Day 3 will be structured to ensure everyone stays engaged audiences from all COST Actions, Session Chairs, Exemplars and Raconteurs.

- Recording and breaking down the main points in this integration day will be the three editors of the meetings proceeding drawn for each COST Action who will use a computer to capture every comment/idea Deliverables for publications
- New ideas/approaches for collaboration and commercialisation?
- New ideas/approaches for academic, public and private support?
- Promotion ideas/insights?
- New IP/Trademark/etc. approaches/process ideas for protecting European research?
- etc
- Define top requirements or restrictions for European collaboration.

#### Structures and Activities

- Proposed Structure of the 'Activity'
  - Day 1: Led by Nanora and leading European Business Schools who will deliver in three sessions (i) State of the art knowledge of business theory research for nanoscience and nanotechnology commercialisation (ii) Overview of key national/European support for research, innovation and commercialisation of nanoscience and nanotechnology (iii) Problems in nano-commercialisation case studies to give overviews and specific details and highlight problems.
  - Day 2: Sessions led by three COST Actions to explore new issues related to their Action. These issues will be debated in a forum with chairs drawn from those that led sessions in Day 1 to ensure experience transferred from Day 1.
  - Day 3: Joint Session with Exemplars of NanoCommercialisation leading all three sessions to lead-out the discussion on report from three Chairs of Day 2 sessions. The Raconteur of the Day 2 meeting will present a report and Chair will summarize the conclusions from the session drawing also on the contribution from Exemplar. The three sessions of Day 3 will be structured to ensure everyone stays engaged audiences from all COST Actions, Session Chairs, Exemplars and Raconteurs.
- Recording and breaking down the main points in this integration day will be the three editors of the proceeding drawn for each COST Action who will use a computer to capture every comment/idea – Questionnaire on factors in Success and Failure of RDI collaboration formation and most specifically those that have not been identified or properly explored previously.

## Structure of New NanoCommercialisation and IP COST Action Issues Meeting



### Rules of Workshop

- No idea is a bad idea
- Volunteers will be identified to write studies drawing from discussion that will be not fully developed in workshop but later fully researched for publications
- Take risks to think laterally and not stay with existing bureaucratic practice
- Criticism thought encouraged but no negative criticism facilitated by Chairs
- Objective of exploring new issues with a view to publishing and assisting NanoScience in Europe to outcompete competitive regions
- Attendants participate in the collaboration factors questionnaire and, if required, interviews that may follow.

### Some newly identified COST Issues

- Issues in 'New Approaches and Support for Academics and SME for Commercialisation'
  - Complementors new role working from direction of COST actions
  - Role of multinationals in new NanoCommercialisation market dynamic in commercialisation of processes, systems and instrumentation by defining 'the problems' to be tackled
  - Smart commercialisation for smart nanoscience
  - Green commercialisation for smart and green nanoscience
  - Hypercompetition in NanoCommercialisation

- Cross-sectoral and cross-disciplinary collaboration / open innovation
- New role of comprehensive 'optimized' multiphysics modelling in protecting IP
- Route to market with support for commercialisation from network of pharmaceutical, microscope, laser and other companies with collective information on market sizes
- New physics for new nanodrop technology commercialisation opening up markets of new entrants despite dominant position of market leaders
- New data quantification methods for nanotechnologies again opening up market to new entrants

### Summarize

- Review ideas
- Identify volunteers and consolidate
- Check requirements and restrictions
- Three Raconteurs and COST Chairs from this Workshop make arrangements to assemble team of volunteers to write under their direction
- Academic Editor appointed from professional from a Business School

### Next: Step1 Publication COST Office Proceedings; Step 2 Nanotechnology Commercialisation Issues Book

- What happens next:
  - Research the ideas generated and PUBLISH as Proceedings and from there as book?
  - Flesh out material obtained from Workshop to identify gaps in proposed publication?
- Generate action items for follow-up:
  - Start turning ideas into reality working with EU COST Office and Chairs of COST Actions
  - Publish Proceedings
  - Discuss with publishers
  - Set timetables
  - Distribution
  - via TINCA, Nanora/Nanora members in counties/Regions, Regulatory Authorities, Government Agencies, COST membership, commercial outlets

### Process for formulating programme of meeting

#### PHASE 1

- Nanora contributions defined
- Check with chairs and key people in three COST Actions they are happy with proposal
- Sketch out programme
- Find leaders from Business Schools to lead the academic business 'Platform' facet of the meeting in Day 1
- MS&T Review Article written

#### PHASE 2

- Identify Chairs of sessions
- Work with NANORA and COST Actions to identify commercialisation and IP issues for discussion at workshop
- Identify venue

#### PHASE 3

- Submit application to EU COST

#### PHASE 4

- Exemplars identified via Nanora
- Publication details finalised

### **Activities on Commercialization, IP and related matters in the 1<sup>st</sup> year of the Action**

The Workgroup conducted a survey of all the partners of the MP1106 Action on their views and activities on commercialisation, IP and related matters. Somewhat surprisingly, three quarters of the respondents were interested in commercialising their research and more than a third had already had success in commercialising a technology or process. Gratifyingly the majority of MP1106 partners were involved in commercialisation in teams and felt their knowledge of these issues were inadequate. This will enable the WG4 activities to be fruitful. The report identified the profile of members as related to these issues, but more importantly the partner's deficiencies, interests and ambitions. An Executive Report will be written for the Chair to present to the Annual Progress Conference of the MNPS Domain will be held on 10-11 September 2013 at Reykjavik, Iceland and a full report will be produced to inform the members of all the Action of the 'Ground-zero' for the Action. The workgroup 4 has according to the official website 33 members but the questionnaire reveals a membership of 46 partners.

The report will be used to define the activities of the workgroup going forward and usefully it has been revealed that several partners have considerable and relevant experienced with regard to commercialisation; partners have been identified who could contribute to WG4 activities to help develop the knowledge, capabilities and commercial prospects of others in the Action. From here, it is hoped decisions can be made on what activities WG4 will undertake and a core group of partners who are wishing to take a leading role in the workgroup have been identified. It is vital for MP1106 partners to agree exactly what the interpretation of the Questionnaire delivers, but perhaps some important initial findings/activities/issues coming are:-

- (i) It was felt by MP1106 respondents that to develop plans for European and international collaboration on commercialization are of central importance; process and instrument commercialization is favored; stages of commercialization is believed to be important; team work in commercialization is vital; group discussions on IP would be useful; networking sessions on IP could provide concrete assistance to partners; 60% feel they would like more help with

commercialization; 70% hope to improve their understanding on how to raise funds for commercialization; developing knowledge of how to link SME and large companies is useful; and finally help to improve the partner's effectiveness and to create tailor made new technologies by an interdisciplinary network would be a desired outcome.

- (ii) The breakdown with suggestions on what activities WG4 should concentrate on are as follows (i) Help with obtaining patent/trademarks 13% (ii) Workshops 23% (iii) Conference 12%; Interactive training and certification 8% (iv) Confidential input from experienced commercialisers 13% (v) Commercial partnering 16% (vi) Help with funding for commercialisation 15%.

A second specific survey of all the workgroup 4 membership was conducted and this report has revealed a low level of activity with regards to intellectual property and commercialisation which is an important finding amongst WG4 partners. The WG4 is specifically charged with developing activities to improve and enlarge these commercialisation capabilities of partners.

The results of this survey are to the questions as to the activities of the WG4 academic partners as the industrial partners are of necessity involved in commercial activities.

*(i) Have you taken out a patent since the Action began or if you have prepared to take out such a patent? 3%*

*(ii) Have you taken out trademarks? 0%*

*(iii) Have you been involved in commercialising any product, process or software? 3%*

*(iv) Have you managed work leading to commercialisation? 3%*

*(v) Have you been involved in consultancy? 6%*

*(vi) Have you written any papers with a commercial content? 3%*

*(vii) Have you written any technical documentation for a product, process or software? 3%*

*(viii) Have you helped or written any advertisements/web sales or for products, processes or software 9%*

*(ix) Have you written any technical articles in trade magazines, technical website? 9%*

*(x) Have you led or been involved in any marketing campaign for products, processes or software? 6%*

This initial survey in 2013 establishes a waterline that will most definitely be used to measure the effectiveness of the activities of the WG4 over the period of the project on the members of the workgroup. Some of the above activities, such as writing technical articles in trade magazines, were done by industrial partners, which mean questions to individuals should have been rephrased to ensure a wider response. The WG4 membership is approximately 25% drawn from industry so that shows there is a very large divide between the experience of those in the workgroup from industry and academia. Whatever, the results show a very low involvement in the academic partners.

The author of this report has undertaken the task of sounding out as many partners as possible at the recent Prague meeting in March 2013 and has from these soundings made a proposal to run a Workshop on 'New Approaches and Support for Academics and SME for Commercialisation'. This proposal had four elements namely presenting the business theory to understand the process of commercialisation; activities of complementors in commercialisation; exploring roles of multinationals; and finally a significant exploration of what partners required as outcomes of this workshop. The COST MP1102 on Chemical imaging by Coherent Raman microscopy – microCoR have responded positively to a joint activity and the details will now be worked on to firm up the proposal as this is the first outcome of the questionnaire that was issued at the start of the MP1106 Action and responds to demands coming from the broad membership of the Action.

The conclusion to be drawn from the preparatory work on behalf of workgroup 4 is there is a serious job of work here required to connect up the academic research community with the fellows in industry.

Norman McMillan, Commercialization Co-Manager

## Annex VIII

### Cooperation with teams of this COST action apart from STSMs in 2<sup>nd</sup> year of the Action

- MPI in Potsdam performed rising bubble experiments with the group of K. Malysa in Krakow and on emulsion stabilization experiments with the group of R. Orr in Porsgrunn.
- The group of T. Sosnowski from Warsaw University of Technology made a common application for HARMONIA 5 project (nanoparticles-lung surfactant interactions) together with the group of Francesca Ravera at CNR Genoa.
- Bubble bouncing experiments are performed by the groups of K. Malysa (PAN Krakow) and N. Vandewalle and S. Dorbolo in Liege.
- Collaboration of P. Colinet (Uni Brussels) with Profs Catherine Colin and Dominique Legendre (IMFT - Toulouse) about the numerical modeling of boiling bubble growth and the influence of a dissolved component and temperature gradient in the liquid (generating a significant Marangoni effect).
- The University of Sofia (K. Marinova) organized cooperation with Unilever and the company Kruess.
- The University Paris Sud performed together with IPF in Paris an experimental studies of surfactant-enhanced alkaline/diluted heavy oil systems.
- Investigations on the role of the interfacial rheology in bubble formation and bubbling processes. (A. Salonen-FR, in collaboration with D. Fairhurst – UK and R. Pugh – CH.
- A study on Interfacial Rheology of surfactant systems performed between Univ. Naples and MPI-KGF (STSM of Perazzo, Guido & Miller)
- Collaborations of CNR in Genoa is running with the MPI-Golm, Univ. Tessoniki and Univ. Aix-Marseille in microgravity-related experiments for emulsions and droplet interfaces.
- Collaborations of CNR in Genoa is running with the MPI-Golm also on the investigation of bubble rising in surfactant-polluted sea waters.
- The group of CNR – IENI in Genoa has also collaboration with G. Cristofolini (Dept. Physics - Univ. Parma-Italy) on dynamic properties of particle-laden surface layers.

### Cooperation with teams of this COST action apart from STSMs in 1<sup>st</sup> year of the Action

1. Rising bubble experiments are performed with the group of K. Malysa in Krakow (Miller DE)
2. Krakow team (Malysa PL) with Golm team (Miller DE)
3. Krakow team (Malysa PL) with Liege team (Dorbolo BE)
4. Krakow team (Malysa PL) with Sofia team (Exerova, Mileva BG)
5. Krakow team (Malysa PL) with IWRI Australia team (Krasowska AU)
6. Cooperation with Unilever NL and Kruess DE (Marinova BG)
7. David Fairhurst UK, Martin Shanahan FR and Sefiane UK on droplet evaporation
8. David Fairhurst UK and Bob Pugh CH on foam stability
9. Victoria Dutschk NL and Jaroslav Katona RS on a new multidisciplinary consortium 'Inkjet printing'
10. -Victoria Dutschk NL and Zoran Šaponjic RS and COST CM1101 on nano-functionalization of textile materials
11. A fruitful cooperation with physicians and biologists lead to interesting results on electric active biocompatible surfaces to be used as biosensor (Guido IT)
12. Food model systems characterization (Navarini, Karapantsios; Guido; Liggieri, Langevin)
13. Bernhard Peters LU, with Luciano Navarini, Illy café, IT and Alidad Amirfazli CA.
14. Cees v.d. Geld NL with the AMC (Amsterdam Medical Center) and EMC (Erasmus Medical Center) concerning boiling in blood as occurring in endovenous laser treatment.
15. Cees v.d. Geld NL with Bronkhorst B.V. and TNO leading to a STW proposal for scientific research with financial support of various industrial partners.
16. Cees v.d. Geld NL with Océ on the topic of evaporating droplets on a porous substrate.
17. Karapantsios GR with School of Veterinary Medicine (AUTH) for sensing bubbles in anesthetized pigs.
18. Katona RS with UPS and IFP Energies Nouvelles
19. Sefiane UK with Shanahan FR on droplet evaporation

20. Koutsos UK with Karapantsios GR on nanoparticles surface characterization
21. Langevin FR with ULB on Thin liquid films
22. Langevin FR with IFP Energies Nouvelles on Enhanced Oil Recovery
23. Langevin FR with ULiege on Foams in Microgravity
24. P Colinet BE with IMFT – Toulouse (Colin, Legendre) and University of Thessaloniki (Karapantsios) on desorption of gases from liquids by boiling, applications in heat transfer and in greenhouse gases regeneration. STSM planned.
25. M. Antoni FR with R. Miller DE on pickering emulsions and interfacial rheology
26. M. Antoni FR with K. Sefiane UK on nanofluid droplet evaporation
27. G. McHale UK with N. Shirtcliffe DE and K. Sefiane UK

## Annex IX

### Report on Thematic Cluster activities in the 2<sup>nd</sup> year of the Action

#### Round Table meeting for Cluster “Nanomaterials and Nanotechnologies coordinated by Mustafa Ersoz on Wed. 23, 2014 from 16.10 till 18.10

##### Agenda for RT5: Nanomaterials and Nanotechnologies

1. Welcome to participants
2. Introduction
3. Discussion of call topics, 2014 and 2015
4. Discussion of Project ideas
5. Planning the timetable for proposal preparation
6. Planning of cluster meeting, combined with Cluster Nanostructured Materials for Water Treatment/Purification (decided on October 15-16, in Antalya, Turkey with Prof Thodoris and Prof Vasileios Koutsos)
7. AOB
8. Closing

##### ITEM 1. Welcome - Adoption of the Agenda

Coordinator Prof. Ersoz welcomes the participants. The agenda was adopted by all of participants.

##### ITEM 2: Introduction

All participants introduced themselves and shared their research fields and explained their research ideas and their expectation from the cluster

##### ITEM 3;

Horizon 2020 programme and its components, were summarized by M. Ersoz, as follows;

Horizon 2020 - Structure and budget

Horizon 2020 - Excellent Science

Horizon 2020 - Societal Challenges

Horizon 2020 - Industrial Leadership

were explained

Later introduction of Horizon programme, Nanosciences, nanotechnologies, materials & new production technologies (NM) and **comparison NMP in FP7 and NMP in Horizon 2020 LEITs** were made and the **new changes** was described.

In the meeting, particularly, the **new terminology** in Horizon 2020 and the **expectation** of Horizon 2020 project proposal, **Technology Readiness Levels** was focused.

The open Call topics in 2014 and 2015 work programme in the area of NMP were summarized by M. Ersoz  
The open calls listed are;

##### Call for Nanotechnologies, Advanced Materials and Production Bridging the gap between nanotechnology research and markets

NMP 2 – 2015: Integration of novel nanomaterials into existing production

NMP 3 – 2015: Manufacturing and control of nanoporous materials

NMP 6 – 2015: Novel nanomatrices and nanocapsules

NMP 7 – 2015: Additive manufacturing for table-top nanofactories

##### Nanotechnology and Advanced Materials for more effective Healthcare



NMP 11 – 2015: Nanomedicine therapy for cancer  
NMP 12 – 2015: Biomaterials for treatment and prevention of Alzheimer’s disease

**Nanotechnology and Advanced Materials for low-carbon energy technologies and Energy Efficiency**

NMP 15 – 2015: Materials innovations for the optimisation of cooling in power plants  
NMP 16 – 2015: Extended in-service life of advanced functional materials in energy technologies (capture, conversion, storage and/or transmission of energy)  
NMP 17 – 2014: Post-lithium ion batteries for electric automotive applications

**Exploiting the cross-sector potential of Nanotechnologies and Advanced materials to drive competitiveness and sustainability**

NMP 19 – 2015: Materials for severe operating conditions, including added-value functionalities  
NMP 22 – 2015: Fibre-based materials for non-clothing applications  
NMP 23 – 2015: Novel materials by design for substituting critical  
NMP 24 – 2015: Low-energy solutions for drinking water production  
NMP 25 – 2014/2015: Accelerating the uptake of nanotechnologies, advanced materials or advanced manufacturing and processing technologies by SMEs

**Safety of nanotechnology-based applications and support for the development of regulation**

NMP 29 – 2015: Increasing the capacity to perform nano-safety assessment  
NMP 30 – 2015: Next generation tools for risk governance of nanomaterials

**Addressing generic needs in support of governance, standards, models and structuring in nanotechnology, advanced materials and advanced manufacturing and processing**

NMP 32 – 2015: Societal engagement on responsible nanotechnology

**Call for FoF - Factories of the Future**

FoF 8 – 2015: ICT-enabled modelling, simulation, analytics and forecasting technologies  
FoF 9 – 2015: ICT Innovation for Manufacturing SMEs (I4MS)  
FoF 10 – 2015: Manufacturing of custom made parts for personalised products  
FoF 11 – 2015: Flexible production systems based on integrated tools for rapid reconfiguration of machinery and robots  
FoF 12 – 2015: Industrial technologies for advanced joining and assembly processes of multi-materials  
FoF 13 – 2015: Re-use and re-manufacturing technologies and equipment for sustainable product lifecycle management  
FoF 14 – 2015: Integrated design and management of production machinery and processes

**Call for EeB – Energy-efficient Buildings**

EeB 5 – 2015: Innovative design tools for refurbishment at building and district level .. EeB 6 – 2015: Integrated solutions of thermal energy storage for building applications . EeB 7 – 2015: New tools and methodologies to reduce the gap between predicted and actual energy performances at the level of buildings and blocks of buildings  
EeB 8 – 2015: Integrated approach to retrofitting of residential buildings

**Call for SPIRE – Sustainable Process Industries**

SPIRE 5 – 2015: New adaptable catalytic reactor methodologies for Process Intensification  
SPIRE 6 – 2015: Energy and resource management systems for improved efficiency in the process industries  
SPIRE 7 – 2015: Recovery technologies for metals and other minerals  
SPIRE 8 – 2015: Solids handling for intensified process technology

**Open discussion and interest of the participants** was asked by M. Ersoz and discussed.

Then the relevant calls for 2014 (submission deadline longer than 6 months) and 2015 programme in the interest of Nanomaterials and Nanotechnologies cluster identified by M. Ersoz, were listed as follows;

Topic identifier	Title	Deadline
NMP 1 – 2014	Open access pilot lines for cost-effective nanocomposites	Single stage, 06/05/2014
NMP 4 – 2014	High definition printing of multifunctional materials	Single stage, 06/05/2014
NMP 5 – 2014	Industrial-scale production of nanomaterials for printing applications	Single stage, 06/05/2014
NMP 21 – 2014	Materials-based solutions for the protection or preservation of European cultural heritage	First stage 06/05/2014 Second Stage 07/10/2014
NMP 28 – 2014	Assessment of environmental fate of nanomaterials	First stage 06/05/2014 Second Stage 07/10/2014

#### 2015 Calls

Topic identifier	Title	Deadline
NMP 2 – 2015	Integration of novel nanomaterials into existing production lines	Single stage, 26/03/2015
NMP 3 – 2015	Manufacturing and control of nanoporous materials	Single stage, 26/03/2015
NMP 6 – 2015	Novel nanomatrices and nanocapsules	Single stage, 26/03/2015
NMP 19 – 2015	Materials for severe operating conditions, including added-value functionalities	First stage 26/03/2015 Second Stage 08/09/2015
NMP 22 – 2015	Fibre-based materials for non-clothing applications	First stage 26/03/2015 Second Stage 08/09/2015
NMP 24 – 2015	Low-energy solutions for drinking water production	First stage 26/03/2015 Second Stage 08/09/2015
Topic identifier	Title	Deadline
FoF 12 – 2015	Industrial technologies for advanced joining and assembly processes of multi-materials	Single stage, 09/12/2014
Topic identifier	Title	Deadline
SPIRE 7 – 2015	Recovery technologies for metals and other minerals	Single stage, 09/12/2014

#### ITEM 4

From these calls, the working documents were reflected on the board, for each topic, the specific challenge, scope of the call, technology readiness levels, and the project type were analysed among the participants. The project idea for the proposals, what is the expectation, what type of proposal can be prepared, Expected impacts were discussed.

Based on the discussion, two topics identified were suitable for preparing a proposal. These are;

NMP 22 – 2015 Fibre-based materials for non-clothing applications.

This topic was chosen for cluster's objectives. **Dr. Thomas Sosnowski** from Warsaw University of Technology, Poland, He accepted as volunteer for taking this as coordinator/contact point.

**SPIRE 7 – 2015 Recovery technologies for metals and other minerals.**

This topic was chosen in the frame of our cluster objectives. **Prof Libero Liggeri**, CNR, Genoa, Italy, he accepted as volunteer to take the responsibility as coordinator/contact point.

**Prof Gunar Bajars** proposed his ideas about the topics, **NMP-17-2014, Post lithium ion batteries for automotive applications.** He pointed out that he take part role, if any project idea identified on this topic, and mentioned that he is trying to take part as a partner for a consortium.

The topic, **NMP 24 – 2015 Low-energy solutions for drinking water production** was discussed. This topic was discussed in details in Nanostructured Materials for Water Treatment/Purification cluster. Consortium nearly formed, intends to submit the proposal

Call for Marie Skłodowska-Curie **Innovative Training Networks** (ITN) 2015 and Call for Marie Skłodowska-Curie **Research and Innovation Staff Exchange** (RISE) 2015

Programmes were described and asked to prepare a proposal for ITN in the 2015.

#### **ITEM 5**

##### **Planning timetable for proposal preparation**

The identified topics will be coordinated by Coordinators, Dr. Thomas Sosnowski and Prof Libero Liggeri.

Project ideas in the other topics will be open to discuss by the cluster members via the cluster mail network at the end of September 2014.

#### **ITEM 6 Cluster meeting**

The cluster meeting were combined Nanostructured Materials for Water Treatment/Purification Cluster. The meeting was decided on October 15 and 16, 2014, in Antalya. However, during October 15-17, 2014, the conference related with Sustainable Food Science and Technology will be held in Portugal and other conference related with nanotechnology will be held in Italy. Therefore, participants requested to change the cluster meeting in different date. Meeting date was discussed and possible date is agreed to be as October 9-10, 2014.

### **Round Table meeting for Cluster “Nanostructured Materials for Water Treatment/Purification” on Tuesday 22, 2014 from 16;10 till 18:10**

**Coordinator: Vasileios Koutsos**

#### **Agenda**

- Welcome
- Members’ short presentations
- Water R&D trends (Thalia Chatzisyneon)
- Open calls related to our cluster (Vasileios Koutsos)
- Discussion

#### Discussion among participants took place and in general the following tasks were considered:

- Recognize appropriate calls
- Recognize potential project co-ordinators
- Identify innovative ideas
- Next steps after the meeting

#### As a result:

- Two relevant calls, to the water cluster, were recognized and discussed as most appropriate. These are the (i) H2020-WATER-2015-two-stage, Water innovation: boosting its value for Europe, and the (ii) H2020-NMP-2015-two-stage Topic: Low-energy solutions for drinking water production call (see attached presentation).
- Most people agreed that (a) innovation lies at developing and using new, smart materials to

improve the efficiency of catalytic and membrane processes, (b) to proceed for a submitting an H2020 project, we should focus on innovation (apart and in addition to fundamental research), (c) it is very important to have SMEs partners to go for an H2020 proposal submission.

- Christos Koukiotis was the only SME (Loufakis Chemicals, Greece) present in the meeting, which is very interested in participating in a H2020 submission proposal.
- Huseyin Selcuk mentioned that he is in contact with a Turkish industry that is keen on coordinating a project for water treatment. He also gave his view about water shortage in Turkey. They are seeking for technologies to provide clean water for areas after catastrophes. Electrodialysis for water desalination can be an option, although there are no experimental data yet.
- All agreed that the main problem of using membrane technologies for desalination plants is the management of the produced brine, so alternative or improved technologies should be found. Also, other parameters of the membrane systems should be studied and optimized, such as membrane wettability and that a cost-effective solution for membrane fouling is needed.
- All participants gave very interesting ideas for H2020 projects, such as the development of new membranes or photomembranes with nanoparticles (Ti, Au); block copolymers to improve membrane wettability; self-assembling of nanomaterials; nanoholes with nanoparticles; etc.
- Gianluca Li Puma suggested various ideas for H2020 projects such as to recover energy from waste by using fuel cells. Wastewater treatment by means of photocatalytic process. Also that it would be interesting to combine nanotubes with titania for photocatalytic applications.
- Zoran Saponjic also suggested and many agreed that there are efficient materials such as TiO<sub>2</sub> (P25) that can work for photocatalysis. However, we should focus on novel smart materials, such as graphene-TiO<sub>2</sub> to divide charges on to TiO<sub>2</sub> surface and thus increase its efficiency.
- Jason Reese suggested that the use of carbon nanotubes can increase water flowrate through membranes by 10%. This technology has been tested only in ultrapure and not for real water samples yet.

#### Next steps for the water cluster

- In general it was agreed that there are two pillars for the 'Materials for water' cluster. These are the utilization of smart materials for water treatment by (a) catalytic processes, and (b) membrane systems. Innovation lies at the development of novel and smart materials that will increase process efficiency.
- Participants should make initial contacts, start working now on ideas and recognize
- potential partners (5-10 partners)
- Identify co-ordinators and form consortiums
- COST can provide financial support for proposal writing
- More discussion about specific calls, ideas and consortiums at Atalia, Turkey meeting

**Round Table meeting for Cluster “Wetting of complex surfaces” on Wednesday 23, 2014 from 10:00 till 12:30**

**Coordinator: Tatiana Gambaryan-Roisman**

**Minutes: Marco Marengo**

- 1) Tatiana Gambaryan-Roisman is describing all the relevant calls in H2020 (see attached slides)
- 2) Gambaryan-Roisman proposes to enter in the H2020 portal and to find out the description of specific calls
- 3) The participants are introducing themselves. There are 21 participants
- 4) C.L. Trabi is an Early Stage Researcher, who can help in writing a proposal
- 5) Marco Marengo is proposing that a suitable proposal could be prepared in the framework of “**Excellence Science**” MSCA-ITN on

“Omniphobic surfaces”.

**Marco Marengo** ([marco.marengo@unibg.it](mailto:marco.marengo@unibg.it)) is available as a coordinator at a preliminary stage. The MSCA calls are expected to be published in summer 2014 with the deadline of beginning/spring 2015 (assumption). The companies SHELL and STATOL could be interested in this topic for phase separation. The interested groups will be required to send their interest to Tatiana Gambaryan-Roisman through the presentation slides. At least 9 people in the room showed an interest.

6) Marengo is also interested in the “**Industrial Leadership**” NMP-07-2015 call “**Additive manufacturing for tabletop nanofactories**”. Marengo is starting to work with Prof. Amirfazli in this field, which is going to be applied to 3D-printers with different materials (composite materials). At least 4 groups could be interested. Trabi is suggesting the conductive inks as a viable material for 3D printing of electronic and thermal components. Dutschk could have two companies interested in this field, one in Netherlands and one in Belgium. The preliminary title is:

„3D printing and Selective Laser Sintering for preparing nanocomposites“.

**Tatiana Gambaryan-Roisman** ([gtatiana@ttd.tu-darmstadt.de](mailto:gtatiana@ttd.tu-darmstadt.de)) can lead preliminary coordination.

7) Gambaryan-Roisman is bringing to the attention of participants the call Water Boosting (H2020-WATER-2015- two stages).

8) Dutschk is raising a practical question: when we are selecting one call, who will be the coordinator and how we will select the partners.

9) Witold Lojkowski suggests writing down some common points in order to organize the “mass” of suggestions as a starting point for the future agreements

10) Gambaryan-Roisman is preparing a very preliminary table with some possible proposals. A third possible topic for proposal was added by Gambaryan-Roisman (“Novel composite surfaces for water treatment”). Polina Prokopovich will contact the RT2 Cluster coordinator. **Witold Lojkowski**

([wl@uni.waw.pl](mailto:wloj@uni.waw.pl)) is adding a fourth proposal about

“Chemical synthesis of nanoparticles using sonochemical technology”, and he is available to be the pivot person for this action.

**Round Table meeting for Cluster “Heat and mass transfer on a solid surface” on Wednesday 23, 2014 from 16:10 till 18:10**

**Coordinator: Cees van der Geld**

**Moderator: Tatiana Gambaryan-Roisman**

**Minutes: Marco Marengo**

- 1) Tatiana Gambaryan-Roisman is describing all the relevant calls in H2020 (see attached slides)
- 2) Tatiana Gambaryan-Roisman proposes to enter in the H2020 portal and to find out the description of specific calls

3) It is clear that the keywords linked to the heat and mass transfer are not directly present in any call. Therefore it is necessary to approach related calls and to figure out potential synergies for MSCA-ITN or similar “fundamental” projects.

4) One call in the pillar “**Industrial Leadership**” is **NMP-15-2015** “Materials innovations for optimisation of cooling in power plants”, where we could propose a project like „Innovative materials and surfaces for cooling intensification“, but the call is quite technological and one needs a company with a power plant. Therefore it is important that any partner in the cluster is trying to understand if there is the availability from a company in an energy technology branch.

5) The “**Excellence Science**” **MSCA-ITN** call could be very interesting (announcement expected for the late summer 2014). One possible project topic is  
„Heat and mass transfer from advanced surfaces: combining material and fluid science for optimized heat transfer solutions“.

Another possible project topic is

„Heat and mass transport in advanced porous structures“.

This project could be proposed under the umbrella or in a strong connection with ESA, which could “profit” of a such proposal to build a complementary activity with respect to the ELIPS and MAP programs. The participants agree that **Balazs Toth** ([balazs.toth@esa-external.com](mailto:balazs.toth@esa-external.com)) would inquire in ESA if there could be a chance even for a coordination of the project. A contact with an EU officer is necessary. In any case, since there are already many companies linked to the future MAP projects, it seems easy enough to collect a relevant number of industrial partners and universities to propose such a project. A coordinator is sought, if ESA is not available to appear in this role.

### **Report on Thematic Cluster activities in the 1<sup>st</sup> year of the Action**

During the Annual Workshop in Prague, following the decision taken in the Dublin meeting in September 2012, three Round Tables (RT) were organized concerning the topics:

- 1) Food, Biotechnology and Biomedical**
- 2) Energy and Environment**
- 3) Nanotechnology and Nanoscience**

The main goal of the RT was to nucleate around specific subtopics a limited number of small clusters of members of the action, which could be active in proposing ideas useful to participate actively in the forthcoming EU calls.

To stimulate the discussion, a general introductory presentation to the RTs was given to the meeting participants, mentioning some of the initiatives recently proposed by the European Commission, such as the Knowledge and Innovation Communities (KIC) and the European Innovation Partnerships (EIP). The general structure of the forthcoming HORIZON 2020 program was also described in a dedicated presentation.

For each RT two moderator were selected, one from industry and one from academia, with the aim of putting together topics of interest for industrial applications and thus capable to attract industrial participation on one hand, and try to connect industrial applications to more fundamental research on the other.

A short summary, reported in the following, was edited by the three academic coordinators in order to briefly describe the main results of the discussions.

The three discussions had a wide and active participation that lead to fruitful and interesting results. During each section a certain number of potential clusters was identified and subject to voting in order to estimate the number of interested participants (reported in bracket in the following lists). In some cases candidates were also identified for the coordination. The overall number of proposed topics and cluster candidates is 16.

It was decided that an e-mail to all COST members will be sent after the workshop asking to express an interest in topics which have already attracted attention during the RT discussion. On the basis of the number of interested people, the Core Group of the Action will decide about the clusters to activate, nominating the respective chairpersons proposing specific meetings during fall 2013. These clusters should

primarily work at focusing more specifically the targeted subject(s).

### **Food, Biotechnology and Biomedical**

Moderators: Simeon Stoyanov, University of Wageningen/ Unilever R&D, The Netherlands  
Libero Liggieri, CNR-Institute, Italy

The proposed topics are quite large and offer several connections with Smart and Green Interfaces. Advanced Medicine (nanomedicine, new diagnostics & therapies) and Efficient production (Raw materials, energy-effective) are important keywords of the Horizon 2020 program.

As far as biotechnology and biomedicine are concerned, a multidisciplinary approach is a mandatory requirement to be successful in such process. It is therefore necessary to involve competences from biology, medicine and pharmaceuticals. Concerning the multidisciplinary issues, it could be useful to check if there are common points to Actions in other COST Domains (Biomedicine and Molecular Biosciences, Food and Agriculture...).

The following list of topics has been proposed:

1. Medical diagnostics & advanced therapies (16)
  - Functionalised particles
  - Biocompatibility
  - Microfluidic devices
  - Biomedical
  - Tissue eng.: interaction of cells with matrix
2. Drug delivery - (20)
  - Capsules & functionalised particles
  - Aerosols
  - Biocompatibility
  - Targeting and in-situ drugs activation
3. Raw materials from biomasses - (17)
  - Surface science for chemical technologies and processes
  - Smarter ways to use Biomass
  - Alternatively derived proteins
  - Surface active bio-molecules (Biosurfactants / proteins)
  - Multiphasic flows
4. Food Science and Technology - (27)
  - Emulsions & Foams
  - Alternatively derived proteins
5. Energy efficiency in food product processing - (22)
  - Smart power (heating / cooling)
  - Smart emulsification/de-emulsification
6. Downstream processing - (20)
  - Smart separation
  - Fermentation
  - Extraction

Some of these topics will be discussed in meetings hosted at the joint workshop with ECIS in September.

### **Energy/Environment round table**

Moderators: C.W.M. van der Geld, Eindhoven Univ. The Netherlands  
N. Lestos, Hephaestus B. M. & Eng. SA, Greece

The three main categories defined in the previous round table discussion, in Dublin, are: Liquid-liquid interfaces; Gas-liquid interfaces; Liquid-gas-solid interfaces. These three categories have surfactants, foams, electric fields, de-foaming and solid foams in common, and each theme comprises quite some well-defined topics (see the report of the Dublin round table discussion), most of which can easily be characterized as green and smart. Examples are particle-coated drops, rapid prototyping.

The list of topics was shown on the screen during the RT discussion in Prague and the audience was stimulated to define concrete topics to be worked on in subgroups of the participants of the COST Action

MP1106.

The defining of topics went fluently and several attendees volunteered to organize a dedicated meeting.

7. Heat and mass transfer to a fluid on a solid substrate (21)

- CFD of free interfaces across which heat and mass transfer takes place.

Mickaël Antoni of Aix-Marseille Univ. and Khelli Sefiane of the Univ. of Edinburgh volunteered to organize a workshop

8. Wetting of complex surfaces (22)

- Contact line motion
- Coatings
- Pinning

Tatiana Gambaryan-Roisman is in the process of organizing a workshop on this topic and the organization can be extended in order to encompass the COST action MP1106 in the way described above

9. Heat transfer with phase change (12)

Flow pattern maps with heat transfer, f.e. in evaporator tubes

10. Increase of safety and energy efficiency in heat and mass transfer processes. (12)

N. Lestos volunteered to organize a workshop

11. Energy-efficient methods to produce emulsions and foams (22)

- Drop break-up
- Oil-water separation

12. Wettability of surfaces in the context of pool boiling and flow boiling (10)

13. New materials with superb thermal and sound insulation properties, (6)

- f.e. based on nanopockets and for use in construction of buildings.

### **Nanotechnology and Nanoscience round table**

Moderators: T. Gambaryan-Roisman (Technische Universität Darmstadt);

C. Koukiotis (Loufakis Chemicals SA)

The lists of topics from the round table during previous meeting in September 2012 in Dublin and the topics proposed during the actual round table have been shown on the screen.

The topics proposed during the meeting in Dublin were: i) Hydrogen production by biocatalysts; ii) Heavy metals reduction; iii) Controlling self-assembly for sensing devices; iv) Fibers as sensors; v) Using natural surfactants for self-assembly of nanofibers. The following discussion has revealed that the items (iii) and (iv) belong to the new formulated topics. The audience was suggested to define new topics of interest, which after a discussion have been organized into three fields:

14. Nanocomposite materials: fabrication, characterization (20+16+12)

Patterned surfaces for sensing devices

Nanoparticles on textiles and nanoparticles on thin polymer films

Nanocomposites based on nanofibers, improvement of adhesion to matrix

Nanocomposites based on nanoparticles and polymers (not voted separately)

15. Nanoparticles and nanocomposites for stabilizing dispersed systems (16)

liquid marbles

pickering emulsions

Bubbles and drops for assembling of nanoparticles and fabrication of nanocomposites and porous materials with and without external stimuli

16. Nanoparticles and graphene oxides and their applications (4)

Membranes

Water desalination

It has been stressed that each topic should address fabrication and characterization of nanoparticles and hazard analysis (toxicity also in mixture and dispersion).