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PEOPLE
MARIE CURIE ACTIONS

International Research Staff Exchange Scheme

Call: FP7-PEOPLE-2009-IRSES

PART B

“SOLGELSENS”

Part B – Table of Contents

To draft PART B of proposals applicants should take into account the following structure and subheadings.

If required for an adequate description of their *project*, applicants may wish to add further headings.

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B 4.1 Relevance of the proposed partnership to the area of collaboration and for the ERA
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Annex (if applicable)
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B 1 Quality of the Exchange Programme

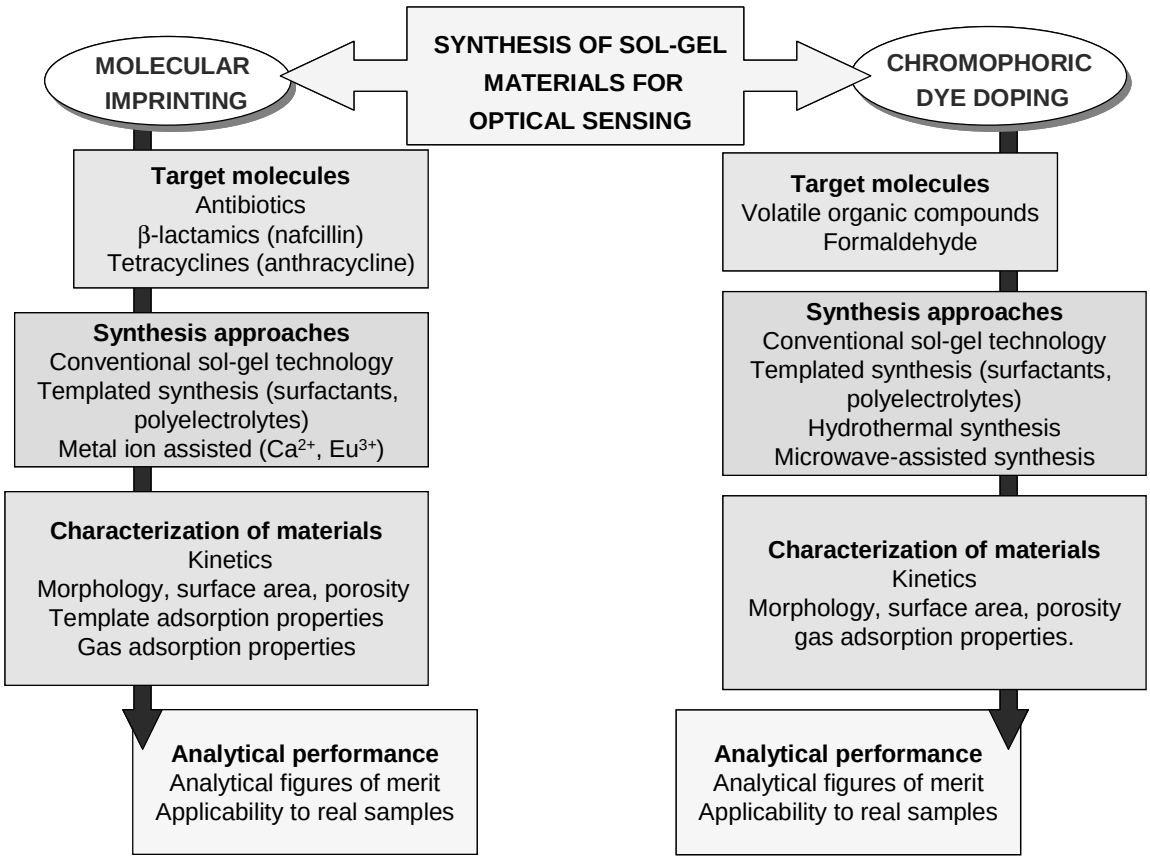
B 1.1 **Objectives and relevance of the joint exchange programme**

- Describe the objectives of the joint exchange programme
- Give an overall description of the exchange scheme and the planned scientific activities
  Please provide in this section:
  - the description of the Work Packages divided by specific tasks
  - the list of milestones, where appropriate
  - the Gantt Chart of secondments

The proposal presented here brings together four research centres devoted to the development of new materials and nanomaterials based on the sol-gel technology, their physico-chemical characterization and their use for sensing purpouses. The partners involved have a recognized history of collaboration at a project level and have worked together in a series of Concerted Actions and Cooperative research in the past. The establishment of this joint exchange programme will promote and strengthen the complementarity of the participants and will stimulate cross-fertilization, thus forming an excellent center of synergy in research, innovation and technology in the area of (nano)materials and sensors. This network offers a complete training in the synthesis and characterization of new materials for sensing. The two main areas of training will concern:

a) Synthesis and physico-chemical characterization of molecularly imprinted polymers against antibiotics (β-lactamics, anthracyclins). Development of integration strategies for optical transduction.
b) Syntehsis and physico-chemical characterization of dye-doped sol-gel materials for volatile organic compounds (VOCs) sensing (model analyte: formaldehyde). Development of integration strategies for optical transduction.

In the scheme below the main lines of actuation of the join exchange programm are summarized:



Molecularly imprinted films for antibiotics sensing.

The use of antibiotics has become integral to the livestock production industry as growth promoters and therapeutic agents. In the European Union, 5000 ton of antibiotics (70% for non-therapeutic purposes) were used in 1999 for veterinary therapy [A.K. Sarmah, M.T. Meyer, A. Boxall, Chemosphere 65 (2006) 725–759.]. Studies have shown that between 17–76% of antibiotics administered to animals are excreted via urine and feces in unaltered form and as metabolites. Land application of manure as a supplement to fertilizer is a common practice in many countries. It is therefore likely that when animal manure is applied to agricultural fields, antibiotic residues can find their way into the receiving environment (e.g. waters). The use of antibiotics in food animals and fertilizers has generated concern due to the potential for increasing antimicrobial resistance, in addition to hypersensitivity for some individuals and on January 1, 2006, the European Union banned the feeding of all antibiotics and related drugs to livestock for growth promotion purposes.

Molecular imprinting exploits the principle of using functional elements of the target molecule to create its own recognition site. This is achieved allowing a template, e.g. an analyte of interest or an analyte closely related to it, to form complexes in solution with one or more polymerisable receptors that have the possibility to interact with the template by covalent, non-covalent or metal coordination interactions. This pre-polymerisation complex is then copolymerized with crosslinker monomer(s) leading to the formation of highly crosslinked polymers. Subsequent removal of the imprint molecule by solvent extraction leaves behind binding sites that are complementary in size and shape to the analyte: a molecular memory is thus introduced into the polymer, which is now capable of rebinding the analyte with high selectivity. Among the advantages of molecularly imprinted polymers (MIPs) are: their chemical and physical stability, relative inexpensive cost and ease of formation. In addition, MIPs are versatile materials that found applications as solid supports for chromatographic separations, membranes and sensors.

Molecularly imprinted materials can be prepared using acrylic-based monomers/crosslinkers or using metal alkoxides as functional monomers through the sol-gel process. In this sense, silica sol-gel technology provides a versatile platform in material sciences for the synthesis of innovative products such as molecularly imprinted sol-gels, encapsulated carriers, luminescent devices, optical sensors and separation media. Among these materials, molecularly imprinted sol-gels are particularly adequate for molecular recognition because preparation is usually straightforward, they are robust, chemical-, mechanical- and thermally stable, with a high level of accessible binding sites and fast mass transfer and binding. However, properties of these tailored imprinted sol-gels are extremely dependent on the synthesis conditions and on the nature of the reagents used. The physico-chemical characteristics such as pore size, morphology and porosity can be altered by changing some synthesis parameters so that template recognition by the imprinted sites, due to its well-arranged structure, can be altered by varying the textural characteristics.

While the selectivity, robustness, and easy handling and synthesis of molecularly imprinted materials make them an ideal choice for the development of sensing devices for antibiotics in foods and water, their use has not been widespread and it deserves active research, from both basic and practical standpoints.

One of our objectives in this program is to elaborate new sensing phases based on sol-gel molecularly imprinted films for antibiotics: β-lactamic (nafcillin as model molecule) and tetracyclines (anthracycline as model template).

In this exchange programm different synthesis approaches for imprinted sol-gel films are considered: a) the conventional sol-gel process in which hydrolysis and polycondensation of alkoxysilanes take place under mild temperature conditions, b) hierarchical double-imprinting approach using non-ionic surfactants (neutral templating approach) in order to enhance hydrophobic interactions with the print molecule, c) a hierarchical double-imprinting process using polyelectrolytes and metal ions (Eu^{3+}, Ca^{2+}) with the aim to promote chelating/electrostatic interactions in the pre-polymerization mixture with the print antibiotic.

Dye doped sol-gel films for formaldehyde sensing.

Indoor air is frequently contaminated with chemical emissions, smoke, dust, mites, and other pollutants, and there is an increasing demand for clean indoor air in homes, commercial buildings, offices, hospitals and schools. Some of the most objectionable pollutants are Volatile Organic Chemicals (or VOCs), found in fuels, cleaning agents, glues, resins, building materials, cosmetics and other sources. One of the most common, toxic and hard to detect VOCs is formaldehyde. Formaldehyde is found in flooring materials, wall coverings, disinfectants, dry cleaning, cosmetics, paint and many other sources. When formaldehyde levels exceed 0.1 ppm the human body begins to experience adverse effects. The World Health Organization has set a standard for safe exposure of 0.08 ppm averaged over 30 min [http://www.euro.who.int/document/aiq/58formaldehyde.pdf].

Although there are a large number of techniques for measuring gas-phase formaldehyde, sensors that are based on colorimetric reagents offer many advantages: inexpensive, simple and require little operator care and are ideal for indoor and outdoor use.

Silica gels seem to be good materials for construction of optical sensors: their visible transparency, porosity enabling the transport of gases or liquids through the material, thermal and chemical stability, and ability to be filled with additional active phases are the key properties that sol-gels bring to sensor applications. In this exchange program several synthesis routes will be assayed for developing colorimetric sol-gel films for formaldehyde sensing:

a) conventional sol-gel synthesis for entrapping a colorimetric dye sensitive to formaldehyde,

b) hierarchical double-imprinting approach using non-ionic surfactants (neutral templating approach) in order to enhance hydrophobic interactions with the dye (addition of surfactant increases the hydrophobicity of the gel and may well changed the pore size, thus resulting in a shorter response time of the sensing layer),

c) hierarchical double-imprinting approach using polyelectrolytes in order to enhance hydrophilic interactions with the dye,

d) microwave-assisted preparation of dye-loaded silica sol-gels and

e) hydrothermal synthesis, in which the chemical reaction takes place under auto-generated pressure upon heating (it is an efficient way to achieve the crystalline phase at relatively low temperatures).

The sensing approach is based on the use of dyes that can be oxidized with strong oxidizing agents. At ultra-trace levels, formaldehyde accelerates the oxidation reaction rate, which allows its the catalytic-kinetic determination.

Objectives for different research activities	Description
Sol-gel sensing materials	Synthesis of molecularly imprinted sol-gels films for antibiotic sensing. Synthesis of dye-doped silica sol-gel films for formaldehyde sensing.
Materials characterization	Physico-chemical characterization of sol-gel materials: adsorption isotherms, binding parameters, surface area, porosity, X-ray diffraction, crystalline powder SEM, TEM, NMR, XPS, XRPD, XANES, thermal analysis, calorimetry.
Sensor development and analytical performance	Development of different sensing prototypes. Sensor prototypes will be tested for their performances and compared with conventional methods of analysis. Application to real samples.

Table 1: List of Work Packages

Work package n°	Work package title	Beneficiary	Start month	End month
1	SYNTHESIS OF MOLECULARLY IMPRINTED SOL-GELS AGAINST ANTIBIOTICS	UNIOVI / UNIKIEV / ESPCI	1	7
2	SYNTHESIS DYE DOPED SOL-GELS FOR FORMALDEHYDE SENSING	UNIKIEV /UPS / UNIOVI / ~~UPMC~~	8	14
3	CHARACTERIZATION OF BIOMIMETIC AND HYBRID SILICA FILMS	UNIKIEV / ESPCI / UNIOVI / ~~UPMC~~	15	21
4	UV-VIS SPECTROSCOPIC CHARACTERIZATION OF SILICA HYBRID SOL-GELS	UPS /UNIKIEV /UNIOVI / ESPCI	22	28
5	ANALYTICAL APPLICATIONS OF THE SYNTHESIZED BIOMIMETIC AND HYBRID SILICA FILMS	UPS / UNIKIEV /UNIOVI	29	36

Table 2: **Work Packages**[1]

Work package number	**1**	**Start date or starting event:**	Month 1
Work package title	SYNTHESIS OF MOLECULARLY IMPRINTED SOL-GELS AGAINST ANTIBIOTICS		
Beneficiaries	**UNIOVI / UNIKIEV / ESPCI**		

Objectives

Synthesis of molecularly imprinted sol-gel films for β-lactamic antibiotics (naficillin as model analyte) and tetracyclines (anthracycline as model). The composition of the alkoxy silane precursors will be studied in order to optimize the selectivity of the films as well as different ways to perform the synthesis (for example, the use of non-ionic surfactants as structure directing templates will allow to tailor the film molecular recognition ability).

Description of work

Task 1.1 : Trainings will be given by UNIOVI on the synthesis of molecularly imprinted sol-gels against nafcillin and anthracycline. Different procedures will be addressed: conventional sol-gel technology, microwave-assisted sol-gel technique and hydrothermal synthesis.

Task 1.2: Trainings will be given by UNIKIEV on the synthesis of silica films in the presence of non-ionic surfactants as structure directing template, followed by hydrophobization of the film, adsorption of the antibiotic template and its coverage with hydrophilic groups. Finally, the antibiotic template is extracted from the film by adequate washings.

Task 1.3: Trainings will be given by UNIKIEV on the synthesis of silica films in the presence of cation-exchange polyelectrolytes and metal ions (calcium, europium) in order to promote interaction of the antibiotic template, thus enhancing the imprint process.

Task 1.4: Trainings will be given by ESPIC on the use of solution-phase NMR analyses of imprinted materials. ^{29}Si MAS NMR is used as diagnostic monitor to identify structural changes occurring in the pre-polymerisation matrix during the imprint process.

Task 1.5: A seminar on “Biomimetic sensing materials” will be held at UNIKIEV by researchers of UNIOVI

Task 1.6. A workshop on “Synthesis of molecularly imprinted materials” will be held in UNIOVI.

Deliverables

D1.1 Protocols for the synthesis of imprinted sol-gels against antibiotics using different synthetic routes.

D1.2 Protocols for the synthesis of antibiotics imprinted sol-gel films using non-ionic surfactants as structure directed templates

D1.3 Protocols for the synthesis of antibiotics imprinted films using polyelectrolytes and metal cations

D1.4. Protocols for the NMR evaluation of the pre-polymerisation interactions among the print molecules and the alkoxy silane precursors

[1] The planning of a work package should be sufficiently detailed to justify the proposed effort and to allow progress monitoring by the *Commission*. A work package of an IRSES proposal may concern the exchange of researcher, the joint research and training activities or joint workshops and seminars, as well as other networking activities.

Researchers involved

UNIOVI	UNIKIEV	ESPCI
Dr. Alfonso Fernández González.	Anastasiya Motorina	Dr. Bruno Bresson
Dr. Rosana Badía	Dr. Oksana Tananaiko	

Work package number	2	Start date or starting event:	Month 10
Work package title	SYNTHESIS DYE DOPED SOL-GELS FOR FORMALDEHYDE SENSING		
Beneficiaries	UNIKIEV / UPS / UNIOVI / ~~UPMC~~ ESPCI		

Objectives

Synthesis of silica films modified with cationic dyes (triarylmethane and triazine classes) sensitive to volatile organic compounds (formaldehyde as model analyte). The application of non-ionic surfactants as structure directing agents permits to tailor the structure and the adsorption characteristics of the film, thus building up the appropriate microenvironment to encapsulate the organic dye. The incorporation of ion-exchange polyelectrolytes into the silica sol allows the preparation of hybrid films with ion-exchange properties. Such films must strongly held the oppositely charged molecules of the indicator inside.

Description of work

Task 2.1 : Trainings will be given by UNIKIEV on the synthesis of dye doped silica films in the presence of structure directed templates. Optimization of the film formation protocol for the best holding of the dye molecule inside the film.

Task 2.2. Trainings will be given by UPS on the synthesis of dye doped silica films for formaldehyde sensing by conventional sol-gel process. Optimization of the film formation protocol for the best holding of the dye molecule inside the film.

Task 2.3. Trainings will be given by ~~UPM~~ ESPCI HOCINE can you take this task? terization of dye doped sol gels. NMR is used as diagnostic monitor to iden aking place during formaldehyde molecular recognition.

Task 2.4: Trainings will be given by UNIOVI on the hydrothermal and microwave-assisted synthesis of dye doped sol-gels. Optimization of the film formation protocol for the best holding of the dye molecule inside the film.

Task 2.5. A seminar on “Physico-chemical characterization of hybrid sol-gel materials” will be held in UPS by researchers of UNIOVI.

Task 2.6. A workshop on “Synthesis of hybrid sol-gel sensing films” will be held in UPS

Deliverables

D2.1 Protocols for silica film synthesis using surfactants and polyelectrolyte as templates

D2.2 Protocols for silica film synthesis by hydrothermal and microwave-assisted approaches.

Researchers involved

UNIKIEV	UPS	~~UPMC~~	UNIOVI
Tatiana Rpozhanchuk	Dr. Marie Rose Mazier	~~Zora Elberrichi~~	Dr. Rubén García M.
			Dr. Sergiy Khainakov

Work package number	3	Start date or starting event:	Month 20
Work package title	CHARACTERIZATION OF BIOMIMETIC AND HYBRID SILICA FILMS		
Beneficiaries	UNIOVI / ESPIC / ~~UPMC~~		

Objectives

At this stage, the physico-chemical properties (porosity, surface topology, surface area, kinetics, etc) have to be studied. The materials morphology and structure resulting from the imprinting process or the dye doping process/synthesis is important for the dynamic binding properties of the synthetic recognition sites. The recognition properties of the biomimetic and hybrid silica films ultimately depend on a variety of factors, including the diffusion/permeation properties of the synthesized polymer structure, binding to selective binding pockets and non-specific interactions. This information is useful to obtain films with excellent adhesion to the surface of the glass substrate, enhanced analytical response towards the studied analyte and understanding the pathway of the future design of the template thin hybrid films.

Description of work

ESPCI Hocine can you take this task?

Task 3.1 : Trainings will be given by UPMC on the study of the gas adsorption (N_2) properties the molecularly imprinted films molecularly imprinted sol-gels in order to evaluate the effect of the template on the film porosity.

Task 3.2. Trainings will be given by UNIOVI on the characterization of the recognition process in imprinted sol-gels: binding parameters and kinetics of the molecularly imprinted films will be addressed.

Task 3.3: Trainings will be given by UNIOVI on the study of porosity and topography using X-Ray Spectroscopy, Calorimetry

Task 3.4: Trainings will be given by UNIKIEV on the study of porosity and topography using Atomic Force Microscopy and Scanning Electronic Microscopy

Task 3.5: Trainings will be given by ESPCI on the NMR solid state characterization of the interactions taking place in molecularly imprinted sol-gels: characterization of the recognition process.

ESPCI Hocine can you take this task?

Task 3.6. A Seminar on NMR as a t…nting process will be held at UNIKIEV by researchers of UPMC

Deliverables

D3.1 Report on the influence of structure directing agents on the silica film porosity and surface morphology and on the recognition process

D3.2 Report on the mechanism of recognition process in imprinted sol-gels

Researchers involved

~~UPMC~~
~~Dr. Jean-Baptiste D'Espinose~~
~~Dr. Jacques Fraissard~~

UNIOVI
Alejandro Simón de Dios
Dr. José Montejo
Dr. Rubén García Menéndez

UNIKIEV
Dr. Tatiana Kovalchuk

ESPCI
Dr- Guenin Erwann

Work package number	4	Start date or starting event:	Month 25
Work package title	UV-VIS SPECTROSCOPIC CHARACTERIZATION OF SILICA HYBRID SOL-GELS		
Beneficiary	**UPS / UNKIEV / UNIOVI / ESPIC**		

Objectives

Investigation of the selectivity and sensitivity of biomimetic hybrid silica films towards nafciline and anthracycline using luminescent techniques (fluorescence, phosphorescence). Study of the spectral behaviour of dye modified films in the recognition reaction involving formaldehyde. Study of the catalytic effect of formaldehyde onto cationic dyes located at the surface of hybrid silica-polyelectrolyte films. Evaluation of the analytical performance characteristics of the sensor materials.

Description of work

Task 4.1 : Trainings will be given by UNIOVI on the spectrochemical characterization of the molecularly imprinted sol-gels against nafcillin and anthracycline. Evaluation of their analytical performance characteristics.

Task 4.2: Trainings will be given by ESPIC on the study of the distribution of dyes onto the silica film surface by solid phase NMR spectroscopy.

Task 4.3: Trainings will be given by UNIKIEV about the catalytic effect of formaldehyde on the cationic dyes adsorbed onto silica hybrid films. Evaluation of the analytical performance for formaldehyde determination.

Task 4.4: Trainings will be given by UPS on the spectroscopic characterization of dye-doped silica hybrid materials obtained through the different synthetic routes.

Task 4.5. A Seminar on NMR as a tool for elucidating the surface processes in sensing materials will be held at UNIOVI by researchers of ESPCI

Task 4.6. A Seminar on Characterization of sensing materials using luminescent techniques will be held at UNIOVI by researchers of UPS

Deliverables

D4.1 Report on the analytical performance characteristics of the molecularly sensing approaches for nafcilin and tetracycline. Analytical methods.

D4.2 Report on the mechanism of recognition process in imprinted sol-gels studied by NMR

D4.3. Report on the optical properties of dye embedded into hybrid silica sol-gels. Infuence of the synthesis route on the sensing properties

D4.4. Report on the analytical performance characteristics of the dye doped hybrid sensing films for formaldehyde. Analytical methods.

Researchers involved

UNIOVI	**ESPCI**	**UNIKIEV**
Dr. Alfonso Fernández González	Dr. Bruno Bresson	Tatiana Kovalchuk
Dr. Rosana Badía Laíño	Dr. Hociene Sfihi	Dr. Oksana Tananaiko

UPS
Dr. Rose-Marie Mazier
Dr. Michael Baltas

Work package number	5	Start date or starting event:	Month 30
Work package title	ANALYTICAL APPLICATIONS OF THE SYNTHESIZED BIOMIMETIC AND HYBRID SILICA FILMS		
Beneficiary	**UPS / UNIKIEV / UNIOVI**		

Objectives

Application of the novel biomimetic films with uniformly distributed active centres for anthracycline and nafcillin. Real samples: food and environmental objects. Development of a sensitive devices for formaldehyde spectrophotometric detection in foods and waters.

Description of work

Task 5.1 : Trainings will be given by UNIOVI on applicability of molecularly imprinted sol-gels against the two antibiotics nafcillin and anthracycline in milk, meet and waters. Evaluation of their analytical performance characteristics.

Task 5.2: Trainings will be given by UPS and UNIOVI: applicability of dye doped hybrid silica films against formaldehyde in food samples (formaldehyde is sometimes added inappropriately in food processing for its preservative and bleaching effects such as dried foods, vermicelli, tripe and chicken paws, etc. It also occurs naturally in the environment and can be found naturally in small amounts in a wide range of raw food, including fruit and vegetables, meat, milk and milk products and fish).

Task 5.3. A seminar on “Hybrid silica sol-gel materials: synthesis and sensor applications” will be held at UNIOVI by researchers of UNIKIEV

Task 5.4. A workshop on “Optical sensing of antibiotics and formaldehyde in real samples” will be held in UNIKIEV

Task 5.5.- A final meeting among partners will be held in UNIOVI.

Deliverables

D5.1 Protocol for the sensitive and rapid determination of nafcilin and anthracycline in milk, meet and waters using luminescent transduction.

D5.2 Protocol of the solid phase spectrophotometric method for formaldehyde determination in water and foods.

D5.3. Final meeting report summary

Researchers involved

UNIOVI	UPS	UNIKIEV
Dr. Alfonso González Fernández	Dr. Marie-Rose Mazier	Dr. Vladimir Zaites
Dr. Marta Elena Díaz García		
Dr. Rosana Badía Laíño		

Table 3: List of Milestones

List and schedule of milestones					
Milestone n°.	**Milestone name**	**WPs n°.**	**Lead Beneficiary**	**Delivery date**	**Comments**
1	Synthesis of molecularly imprinted polymers for nafcillin	1	UNIKIEV UNIOVI ESPIC	Month 5	Completion of synthesis of imprinted sol-gels with desired sensitivity/selectivity for nafcillin. Investigated adsorption characteristics of the materials and interaction mechanisms.
2	Synthesis of molecularly imprinted polymers for anthracycline	1	UNIKIEV UNIOVI ESPIC	Month 8	Completion of synthesis of imprinted sol-gels with desired sensitivity/selectivity for anthracycline. Investigated adsorption characteristics of the materials and interaction mechanisms.
4	Synthesis of dye doped hybrid silica sol-gels	2	UNIOVI UNIKIEV UPS	Month 15	Completed synthesis of dye doped films of hybrid silica for formaldehyde. Spectroscopic characterization of sensing films.
5	Completed characterization of materials	3 and 4	ALL	Month 22	Completed morphological characterization of imprinted sol-gels and dye doped films.
6	Preparation of sensing protocols and testing devices	4 and 5	UNIKIEV UNIOVI UPS	Month 29	Developed and validated sensing approaches incorporating the molecularly imprinted sol-gels and dye doped films.
7	Analytical applications	5	UNIKIEV UNIOVI UPS	Month 36	Real sample analysis and quantitation of nafcillin, anthracyclin and formaldehyde residues in food samples (milk, waters).
8	Complete file report	5	UNIOVI	Month 36	Results and discussion of the programme exchange

Table 4: Gantt chart of secondments

The Gantt chart shall illustrate the secondments of exchanged staff towards all the participant organisations for the whole duration of the *project*.

SECONDMENTS	YEAR 1												YEAR 2												YEAR 3											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
BENECIFIARY 1 UNIOVI																																				
Research Professor H to partner 2																					22															
Research Professor E to partner 2																						25														
Staff researcher D to partner 2																			22	22	22															
Early researcher A to partner 3							12	12	12				13	13	13																					
Staff researcher B to partner 3							15																													
Staff researcher D to partner 3													21	21	21	21	21	21							43	43	43									
Staff researcher F to partner 3																															34	34	34			
Staff researcher B to partner 4													14																							
Early researcher A to partner 5																												31	31	31						
Staff researcher C to partner 5													23																							
BENEFICIARY 2 UPS																																				
Research Professor J to partner 1																													46							
Staff researcher I to partner 1																									41	41										
Staff researcher I to partner 3																			21	21								43	43	43						
Staff researcher I to partner 4																															42	42	42			
PARTNER 3 UNIKIEV																																				
Early researcher K to partner 1	11	11	11	11	11	11																		33	33	33				51	51	51				
Staff researcher L to partner 1												24	24	24																						
Early researcher M to partner 1							11	11	11											32	32	32														
Research Professor O to partner 1																																		53		
Early researcher M to partner 2																												44	44	44	52	52	52			
Staff researcher L to partner 4																								35	35	35										
Staff researcher N to partner 4																											42	42	42							
Staff researcher N to partner 5																				31	31	31														
BENEFICIARY 4 ESPCI																																				
Research Professor P to partner 1																														45						
Staff researcher Q to partner 1																					32	32														
Staff researcher R to partner 1																								33	33	33										
Staff researcher Q to partner 3																											34	34	34							
Staff researcher R to partner 5																23	23	23																		
BENEFICIARY 5 UPMC																																				
Staff researcher T to partner 1																									33	33										
Early researcher S to partner 3																								34	34	34										
Research Professor U to partner 3																															36					
Early researcher S to partner 4								14	14	14																										
Staff researcher T to partner 4																											35	35	35							

- Demonstrate that the numbers of exchanged staff and the duration of their exchange are adequate to achieve the objectives of the programme.

In Annex 2, a summary of the gantt secondment chart was included. In it, we can see that the total secondments at each research center is balanced taking into account the tasks developed in each. So, UNIOVI and UNIKIEV have the larger secondments as synthesis, characterization and analytical tasks will be developed by researchers, while UPS, ESPCI and ~~UPMC~~ have together similar secondments that UNIOVI or UNIKIEV as characterization tasks are the main objetives.

On the other hand, total efforts (months of work) devoted to those tasks in which different synthesis approaches will be performed are higher than those tasks in which characterization of a particular material will be done. So, the time devoted to each task is balanced according their complexity.

B 1.2 Scientific quality of the partners

UNIOVI (Beneficiary 1)

Prof. Santiago García-Granda
Expertise: X-Ray Diffraction
Role: Coordinator Structural characterization of new materials.
Goals to be achieved: Program exchange coordination. Supervision structural characterization of the new sensing materials synthesized during the development of the project.

Prof. José Rubén García-Menéndez
Expertise: Synthesis, structure, texture, phosphorus compounds, ionic exchange, catalysis, adsorption and ionic conductivity.
Role: Characterization of inorganic materials sensitive to antibiotics or formaldehyde.
Goals to be achieved: Determination of the physico-chemical characteristics of the synthesized materials. Studies on the correlation between their properties and the sensing properties.

Prof. Marta Elena Díaz-García
Expertise: Molecular imprinting, Nanostructured materials, Sol-gels, Optical methods, Sensors
Role: Supervision the synthesis of imprinted materials that are going on.
Goals to be achieved: Development of new imprinted materials for nafcillin and anthracycline, Design of sensor prototypes.

Dr. Alfonso Fernández González
Expertise: Molecular imprinted polymers and sol-gels. Optical techniques of analysis.
Role: Development of molecularly imprinted materials for nafcillin.
Goals to be achieved: The synthesis of imprinted sol-gels against nafcillin. Molecular recognition evaluation using luminescence techniques. Real sample applicability of the developed sensors.

Dr. Rosana Badía-Laíño
Expertise: Sensors, optical analytical techniques, molecular imprinting
Role: Development of molecularly imprinted materials for anthracycline.
Goals to be achieved: The synthesis of imprinted sol-gels against anthracycline. Molecular recognition evaluation using luminescence techniques. Real sample applicability of the developed sensors.

Dr. Sergei Khainakov
Expertise: Hydrothermal synthesis and Microwave-assisted hydrothermal synthesis.
Role: Assisting the researchers in the hydrothermal synthesis of sensing materials.
Goals to be achieved: Prepare materials through hydrothermal synthesis equivalent to those prepared by other routes. Comparison of the physico-chemical and sensing properties of both hydrothermally and non-hydrothermally synthesized materials.

Dr. Jose Manuel Montejo-Bernardo
Expertise: X-ray spectrometry structural characterization of materials
Role: Structural characterization of imprinted sol-gels for antibiotics and hybrid silica films for formaldehyde.
Goals to be achieved: Physico-chemical characterization of sensing materials. X-ray spectrometry, AFM, SEM and TEM studies of the samples.

PhD student Alejandro Simón de Dios
Expertise: Molecular imprinting of sol-gels against amino acids and peptides. Synthesis of molecularly imprinted sol-gel nanotubes. Luminescence techniques.
Role: Development of molecularly imprinted sol-gels against antibiotics
Goals to be achieved: Study of kinetics and binding affinity parameters of molecularly imprinted sol-gels against nafcillin and tetracycline. Adsorption isotherms.

UPS (Beneficiary 2)

Dr. Michael Baltas
Expertise: Organic synthesis, assymetric synthesis, multi-step synthesis, reaction mechanisms.
Role: Design and synthesis of luminescent/chromogenic cationic dyes for volatile organic compounds
Goals to be achieved: Synthesis of chromogenic/fluorescent cationic dyes sensitive to formaldehyde suitable for sensing.

Dr. Marie-Rose Mazier
Expertise: Photophysics, photochemistry, synthesis and reactivity of cyanines , merocyanines and polymethinium salts. Ionic transport . UV-vis and fluorescence spectroscopy.
Role: Synthesis of the chromophoric cationic dyes for formaldehyde determination; luminescence measurements of the modified hybrid silica films and imprinted materials
Goals to be achieved: The design of the hybrid silica-polyelectrolyte modified with cationic dye sensitive for formaldehyde; Spectroscopic characteristics of the synthesized hybrid films. Analytical evaluation of imprinted polymers.

UNIKIEV (Partner 3)

Prof. V. Zaitev
Expertise: Modified silica chemistry
Role: Silica modification and hydrophobization of the surface of silica films. Overall supervising of the UNIKIEV group.
Goals to be achieved: The design of a new type of biomimetic films sensitive for the special antibiotic; Morphology of biomimetic and hybrid silica films
Reason for exchanging managerial: V. Zaitev is a well known specialist in the field of surface chemistry of silica. His experience will be important for the development of biomimetic silica films of special hydrophobicity and porosity

Dr. Tatiana Kovalchuk
Expertise : Modified silica chemistry
Role: Study the distribution of the modificator molecules inside silica matrix. Study of silica morphology by spectroscopic and microscopic techniques (NMR, AFM, SEM)
Goals to be achieved: The design of a new type of biomimetic films sensitive for nafcillin; morphology of biomimetic and hybrid silica films
Reason for exchanging managerial: she is a specialist

Dr. Oksana Tananaiko
Expertise: silica film sol- gel synthesis and their application in spectroscopic analysis of water and bio objects; analytical application of the synthesized biomimetic and hybrid films
Role: Thin film sol-gel synthesis in the present of structure directed templates.

Goals to be achieved: The design of the hybrid silica-polyelectrolyte modified with cationic dye sensitive for formaldehyde
Reason for exchanging managerial: She has a great experience in silica sol- gel synthesis of thin films and development of sensitive elements for optical and electrochemical sensors on their base

PhD student Anastasiya Motorina
Expertise: Silica film sol- gel synthesis and its application in analysis of water and bio objects
Role: The design of a new type of biomimetic films sensitive for tetracycline; Spectroscopic measurements of thin silica films by UV-VIS and luminescent methods, development methods of tetracycline determination using biomimetic silica films.
Goals to be achieved: Analytical application of the synthesized biomimetic and hybrid films
Reason for exchanging managerial: She has experience in silica sol-gel synthesis of thin films

PhD student Tatiana Rpozhanchuk
Expertise: Silica film sol- gel synthesis and its application in analysis of water and bio objects
Role: Development of methods of formaldehyde determination using hybrid silica polyelectrolyte film
Goals to be achieved: The design of the hybrid silica-polyelectrolyte modified with cationic dye sensitive for formaldehyde
Analytical application of the synthesized biomimetic and hybrid films
Reason for exchanging managerial: Experience in hybrid silica sol-gel synthesis

ESPCI (Beneficiary 4)

Prof. Hociene Sfihi
Expertise: NMR spectroscopy
Role: Solid-phase NMR spectroscopic study of the modified films; distribution of the molecules-modificators inside the film
Goal to be achieved: Spectroscopic characteristics of the synthesized hybrid film

Dr. Bruno Bresson
Expertise: NMR spectroscopy
Role: Solid-phase NMR spectroscopy and relaxation RNR characterization of nanocomposite materials and synthetic porous materials.
Goals to be achieved: Evaluation of the interaction among template analytes and alkoxysilane precursors in order to dilucidate pre-plymerization interactions (molecular recognition mechanism)

Dr. Guenin Erwann
Expertise: Peptide synthesis, solid support synthesis, phosphorous chemistry. Biological properties of phosphorous or peptide-like therapeutics. Biopolymer functionalization for biomolecules analysis.
Role: Molecular recognition in biomimetic materials
Goals to be achieved: Design of tailored biomimetic materials for optimization of the recognition process.

~~**UPMC (Beneficiary 5)**~~

~~**Prof. Jacques Fraissard**~~
~~Expertise: Characterization of solid catalyst (mainly porous) and solid gas interactions.~~
~~Role: Chemical characterization of sensing materials mainly by NMR of solids~~
~~Goals to be achieved: The development of the conception of the sensor sensitivity mechanism.~~
~~Influence of a long term work of the sensors on their properties and microstructures of their surfaces~~

~~**Dr. Jean-Baptiste D'Espinose**~~
~~Expertise : Specialist of Solid NMR, diffusion and Electron Microscopy.~~
~~Role: Gas adsorption properties~~

~~Goals to be achieved: Gas adsorption properties with specially adsorbed xenon used as a probe for the NMR determination of the porosity~~

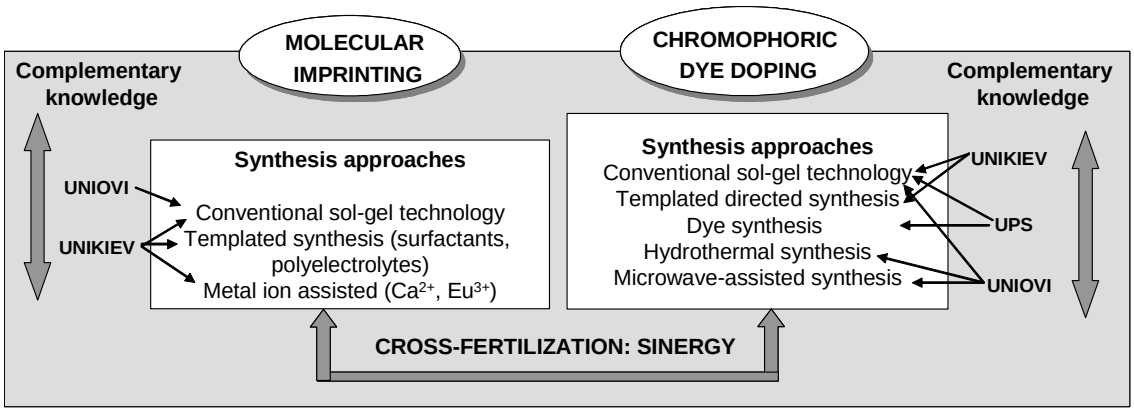
~~PhD student Zora Elberrichi~~

~~Expertise: Interactions solid surface-adsorbed molecules.~~
~~Role: Gas diffusion. Coefficient of diffusion of various gases during the adsorption~~
~~Goals to be achieved: microstructures of the surfaces of the sensor materials. Development of a model of the mechanism of the sensor sensitivity~~

B 1.3 Complementarities/synergies between the partners

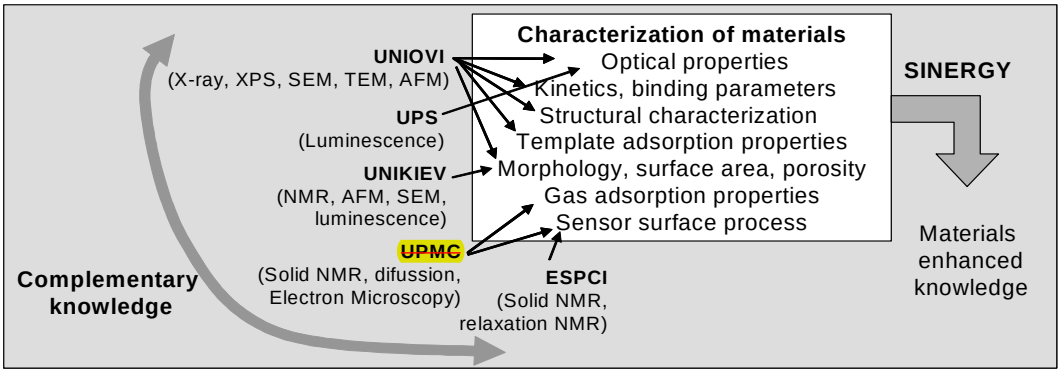
The complementarities and synergies among the partners is illustrated in the figures below, considering the different objectives of the project.

a) Concerning the synthesis of materials, it is clear from the diagram that three partners have skills that are complementary to each other (e.g. conventional sol-gel technology and templated directed synthesis) while there are partners that are specialist in a particular synthetic approach (e.g. hydrothermal synthesis, microwave-assisted synthesis, dye synthesis, molecular imprinting)



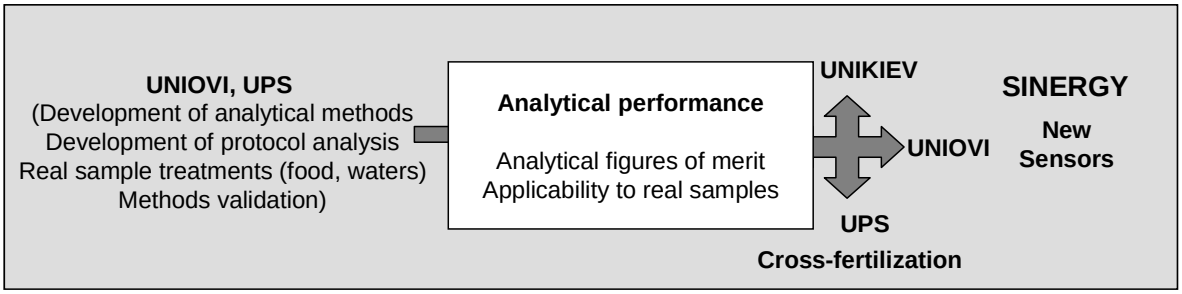
Exchange of researchers among the UNIKIEV, UPS and UNIOVI teams will allow cross-fertilization through interchange of knowledge and synergy in the development of new materials through new synthetic routes:

b) Concerning the physico-chemical characterization of the sensing materials, complementarities can be found among the partners (e.g. those specialists in NMR, AFM, SEM techniques) while others have particular skills (e.g. UNIOVI working in X-ray spectroscopy, room temperature phosphorescence).



Again, the translation of researchers to the host partner having the key technology/knowledge for materials characterization will enhance the transfer of knowledge, avoiding duplication of experiments and thus, a synergic effect is expected.

c) Concerning the analytical performance, applicability and validation of the developed sensors, the program will allow the translation of the sensing materials into devices for real samples analysis, transferring the protocols of the methodologies to all the partners.



B 2 Transfer of Knowledge

B 2.1 Quality and mutual benefit of the transfer of knowledge

- Describe the programme for the transfer of knowledge between the partners. Please give detailed information about e.g. the number of workshops/conferences/training, the target audience, sustainability of the knowledge transfer, etc.
- Describe the added value (in terms of gained knowledge) for the partners involved

The fundamentals of the molecular recognition process in sensing as well as the development of reliable optical sensing approaches and its application in real sample analysis demands for various skills, that can be offered by experts from different scientific fields. The groups in this project, with different expertise, are necessary to develop sensors for a reliable analytical control of antibiotics and formaldehyde in real samples. Organic chemists in the field of dye chemistry are necessary in the combination with materials chemists, which are professions in development of functional materials and membranes. The knowledge of analytical chemists are also needed to develop sensitive sensor approaches for hazardous chemicals and drugs. Furthermore, they have the knowledge for translate the sensing protocol to a particular real sample. Also, the knowledge of expertises in materials characterization and the processes taking place at the sensing material interface is necessary in order to understand the molecular recognition process (e.g. in the imprinted binding sites in molecularly imprinted sol-gels). By knowing more about sensing materials, new applications of already developed methods can be envisaged.

This project proposes a multidisciplinary group, with a critical mass supported by full-time staff, to fuse their considerable expertise in the area of optical sensors and materials characterization into a coherent forum for exchange of best practice, technology transfer, problem solving, training and demonstration. It is important to note the contribution made by the Associated Candidate Country, where resides a huge wealth of technical and scientific capability with a strong desire to enhance its ability to contribute solutions to the sensor technology and to participate in the creation of new manufacturing capability.

Training and seminars. A comprehensive training and exchange program to facilitate and fund access to those finest training resources in synthesis and characterization of sensing materials and sensor development. This will be focussed on young scientists, allowing them also to attend a range of custom designed seminars given by qualified expertises in each field. Six seminars have been proposed (see information in the Workpackages 1-5). The target audience of these seminars are not only the members of the different partners (staff, PhD students), but also it is expected that post-graduate students and researchers of other research groups also attend them (open access seminars).

Workshops. During concerted workshops, responsible from each partner involved, have to define together novel solutions for the application of sensors in the chosen samples (processes), which results in a reliable and improved sensing protocol. Three workshops will be held (see information in the Workpackages 1, 2 and 5).

B 2.3 Adequacy and role of staff exchanged with respect to the transfer of knowledge

- Describe the role of the exchanged researchers and their specific expertise. Define the goals to be achieved through their exchange
- If applicable: describe the reasons for exchanging managerial/technical staff and explain their specific role and the goals to be achieved through their exchange

B 3 Implementation

B 3.1 Capacities (expertise/human resources/facilities/infrastructure) to achieve the objectives of the planned cooperation

Beneficiary 1: UNIVERSITY OF OVIEDO	
Research/Projects	Infrastructure/Facilities
1. Sol-gel imprinted materials for optical recognition of antibiotics. FICYT Ref. IB05-012 2. Synthesis of molecularly imprinted sol-gels against protein markers: development of sensing approaches. The Scientific and Technical Research Council of Spain, Project Nº CTQ2006-14644-C02-01/BQU. 3. Controlled designo of new hybrid organic-inorganic materials of low dimensionality. MEC-06-PCI2005-A7-0110 University of Oviedo-University of Kiev 4. Free-additive electrolitic layers based on nano-crystalline nickel for industrial uses. Diseño Fabricación y Medio Ambiente S.A. 2007 5. FTIR Microscopy Equipment MEC # CTQ2006-27172-E/BQU; FICYT # EQIP07-00 2007 6. Ecothermodynamics: The Kyoto protocol and the calorimetric techniques. The Scientific and Technical Research Council of Spain (MAT2007-30846-E) 2008 7. X-ray diffractometer: characterization of nano-structured materials. FICYT (FC-08-EQUIP-14) 2008	The research group UNIOVI provides fully equipped laboratory facilities for the synthesis of molecularly imprinted and dye-doped sol-gels and for their characterisation. The following equipment for analysis and characterisation of silica materials is available: 1 Absorbance (VIS-UV) spectrophotometer and 2 fluorescence spectrophotometers equipped with different accessories (reader plate, flow-cell, attachment for solids), Microwave Labstation "Ethos 900" equipped with autoclaves, Chemisorption Micromeritics ASAP 2020. Also, minor common equipments are available. The group has total accessibility to the equipments available in the Common Services of the University: FT-IR Microscopy, Circular Dichroism, XPS, crystalline podwer X-ray diffraction, XRPD, Absorption XAFS and XANES, thermocalorimetry, SEM, TEM, AFM. The group has accessibility to Radiation Synchroton (ESRF), in public lines and in the Spanish CRG lines: BM25-Spline and BM16. Dr. Santiago García Granda Dr. Rubén García Menéndez Dr. Marta Elena Díaz García Dr. Sergiyi Khainakov Dr. Alfonso González Fernández Dr. Rosana Badía Laíño Dr. José Manuel Montejo Bernardo Alejandro Simón de Dios

Beneficiary 2: UPS	
Research/Projects	Infrastructure/Facilities
ETH de Zürich (Suisse: 3/01/96-27/02/97 (Pr Andrea VASELLA) «Synthesis of fused pyrrolo and triazolo sugars, potential inhibitors of glycosidases »	The UPS team, supervised by DR.Michel Baltas, is composed of 30 staff researchers. The research lines are : synthesis of natural products and analogues, Study of the action mechanism with the biological activity, b) fluorescent labels, radiochemistry and NMR in biomedical studies. The team environment is multidisciplinary with collaborations with departments of medicine, pharmacy and agrobiology as well as with industries. The equipment available includes : Spectroscopy NMR 300 to 500 MHz for RMN in liquid state and 400 MHz NMR for solid-state. Different probes are available, variable temperature, working stations on and off line, 3 X-ray Diffraction (imaging plate diffraction system base temperature < 15 K), 5 Mass Spectrometers (Q-Tof, MALDI-Tof, Electrospray,EI,CI,FAB…) with possibilities to hyphenate to LC/MS and MS/MS, 3 potentiostats. The laboratory is equipped with the necessary labware and minor equipments to perform the project and facilities to access UV-visible spectrophotometry, IR-FT, chromatography (2 chiral columns, 3 HPLC analytical equipments, 2 semi- and 2-preparative chromatography equipments). Dr. Michael Baltas Dr. Marie-Rose Mazières

Partner 3: UNIKIEV	
Research/Projects	Infrastructure/Facilities
The UNIKIEV team has a great experience in the field of international cooperation. The following projects are some examples: **1.** The development of new sensor nanotechnology for the rapid detection of the bioagents. NATO. Project Nº SfP 981 786. Partners: Israel Institute of Technology, University of Genova, UNIKIEV **2.** New functionalized materials for the separation of the toxicants from the drinking water. NATO. Project Nº RIG 981555. Partners: ~~UPMC~~, UNIKIEV **3.** Hydrogen reservoirs based on porous silicon nanostructures for portable devices. INTAS. Project Nº 05-7729. Partners: INSA-Lyon (France), UNIKIEV **4.** Tailor's synthesis of new organo-inorganic hybrid materials with low dimensionality. Scientific and Tehnical Research Council of Spain. Project Nº PCI2005-A7-0110. Partners: UNIOVI, UNIKIEV **5.** Ionic associates on base of organic base as a electrochemical sensors in ionometry. APVV Project Nº SK-UA-00806, Partners: University of Kosice (Slovenia), UNIKIEV **6.** Design of nanodispersed mono and bimetallic catalysts. Dnipro 2007, Partners: ~~UPMC,~~ UNIKIEV	The Department of Analytical Chemistry of the University of Kiev is one of the well-known centres of analytical and surface chemistry in Ukraine. The staff is composed of 3 Professors, 6 associate professors, 10 researchers and 10 engineers. The UNIKIEV team is composed of six members: 1 Professor, 2 associate professors and 3 PhD students. Principal investigator from UNIKIEV (Prof. V. Zaitsev) is a well known authority in the field of surface science and surface modified silica materials. Within the team there is a group which specialise in the development of hybrid sorption spectroscopic and amperometric methods for the determination of traces of organic and inorganic pollutants in foods and environmental objects (Dr. O. Tananaiko). This group has significant experience in the field of silica films sol-gel synthesis and preparation of sensitive elements of optical and electrochemical sensors. Dr. Vladimir N. Zaitsev Dr. Tatiana Kovalchuk Dr. Oksana Tanananiko PhD student Anastasiya Motorina PhD student Tatiana Rpozhanchuk

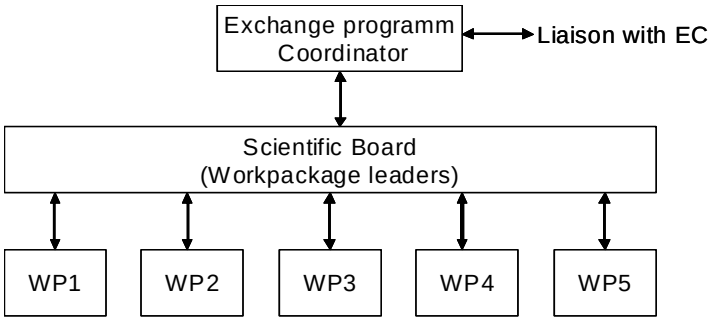
Beneficiary 4: ESPCI	
Research/Projects	Infrastructure/Facilities
	The Laboratoire de Physique Quantique is especialized in the study of various solids by NMR spectroscopy, with special focus on the materials used as heterogeneous catalysts and catalyst supports, adsorbents, ceramics, biocompatible and biomaterials, organomineral nanocoposites, concrete, luminescent nanomaterials, cyclodextrins, and so on. The group uses nuclear magnetic resonance to study physico-chemistry of the solid materials in bulk, at the surfaces and interfaces and, to study the transformation phenomena induced by heating, treatments, chemical functionalization, as well as the structural changes in the spent catalysts. In the ESPCI group there are available two Bruker ASX NMR spectrometers (nominal frequencies 300&500 MHz), equipped with numerous probes working at different frequencies. Specific probes use the magic angle spinning (MAS) method and double resonance. This enables to observe a large variety of nucleus (^{1}H, ^{13}C, ^{17}O, ^{19}F, ^{23}Na, ^{27}Al, ^{31}P, ^{43}Ca, ^{129}Xe, etc). In addition, the NMR group has free access to a Bruker Avance 300 NMR spectrometer devoted mainly to hyperpolarized Xe (by optical pumping) and dynamic (diffusion and micro-imaging) measurements. This significant tool is perfectly adapted to the analysis of the properties of materials both for fundamental and applied research. Dr. Hocine Sfihi Dr. Bruno Bresson Dr. Guenin Erwann

Beneficiary 5: ~~UPMC~~	
~~Research/Projects~~	~~Infrastructure/Facilities~~
~~1. Cost Chemistry action D5/0002/94,1994-1997 (J. Fraissard, coordinator) European Contract with : J.Heyrovsky Institute of Physical Chemistry, Prague, Czech Rep.; Leiden State University , Gorlaeus Laboratories, Leiden, The Netherlands "Surface chemistry involving hydrogen transfer in reactions of simple alcohols, acetone, olefins and ammonia over crystaline metallosilicates."~~ ~~2. INTAS N°96-0978, 1997-1999. (J. Fraissard, coord inator)~~ ~~European Contract with the polytechnicum of Zurich (Pr Baiker), Kiev University (Pr Zaitsev) and the Institute of Biochemistry and Petrochemistry of Kiev (Pr Patrylak) " Synthesis and catalytic activity of new superacid solids "~~ ~~3.NATO, SCIENCE FOR PEACE , 1998-2001 (J. Fraissard, director)~~ ~~International Contract with National Taras Shevchenko University de Kiev (Pr. Zaitsev) and Karakalpak State University, Nukus, Uzbekistan (Pr. K. Uteniatov) "Superacid Solids "~~ ~~4. INTAS N°97-116 , 1998-2000. (J. Fraissard, coord inator)~~ ~~European Contract with the National Taras Shevchenko University of Kiev (Pr. Zaitsev), the universities of Southampton (Pr Evans) , of Fribourg (Pr. Schlaepfer) and of Moldavia (Pr Revenko)~~ ~~5. Cost Chemistry action D15/0016/00 , 2000-2004 (J. Fraissard, coordinator) European Contract with universities of : Bucarest (Hungary), Leiden (The Netherlands), Palermo (Italy), Sofia (Bulgaria) and the Krakow Institute of Catalysis (Poland) " Gold-based Solid Catalysts: Preparation, Characterization and Catalytic Activity"~~ ~~6. Cost Chemistry action D36/0003/06 , 2006-2010~~ ~~European Contract with universities of : Bucarest (Hungary), Palermo (Italy), Sofia (Bulgaria), Bucarest (Romania) and the Krakow Institute of Catalysis (Poland) "Interfacial functionalization of (bi)-metallic nanoparticles to prepare highly active and selective catalysts: understanding synergy and/or promotion effect"~~	~~The UPMC team offers the possibility of carrying out research in a multidisciplinary environment set up by personnel with different backgrounds such as chemistry, physics and engineering. The laboratory is equipped with the required material and infraestructure to develop this project.~~ ~~The UPMC team has been the pioneer of several techniques (now very much used) for the characterization of solid surfaces. These techniques can be useful to perform the objectives of this exchange project.~~ ~~The following equipments will be used in this project:~~ ~~Electron Microscopy~~ ~~NMR spectrometer (300 and 500 MHz)~~ ~~Dr. J. Fraissard~~ ~~PhD student Zora Elberrichi~~ ~~Dr. Jean Baptiste D'Espinose~~

B 3.2 Appropriateness of the plans for the overall management of the exchange programme

- Describe the management plan of the exchange scheme (e.g. support for detached and incoming personnel)
- Demonstrate that the complementarities and synergies between the partners are well exploited

The overall management structure is shown in Figure below:



The coordinator will act as the chief executive and will have overall responsibility for the direction and smooth running of the program, monitoring progress of the entire programme and ensuring that each work package is completed. He will provide the principal link to the EC and will be responsible for keeping management-level accounts.
The Scientific Board, composed of all Workpackage Leaders, is responsible for the overall scientific management of the exchange programme and ensures that all work meets the stated requirements, decides upon measures in the framework of controls and monitoring of the progress of the scientific work affecting the exchange programme as a whole.
Workpackage leaders (WPLs) are responsible for the organisational arrangements, work procedures and time schedule within their workpackages. WPLs keep the Scientific Board informed on the current status of task activities. To ensure the proper quality of the work, WPLs organise and chair particular WP meetings.

Quarterly reports (every 6 months) are internal documents to help the coordinator to monitor the efforts of all partners. These internal quarterly reports consist of a table of efforts spent on tasks within WPs. They will be completed by each partner and sent by email to the coordinator no later than one month after the end of the reporting period.
The coordinator will also prepare quarterly reports on the basis of reports sent by all partners.

Annual reports, consistent with EC requirements, will contain an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken. It also includes a publishable executive summary and an updated plan for using and disseminating the knowledge. These reports will be prepared by the coordinator on the basis of input from all partners and quarterly reports and approved by partners.
All partners will have to send their contribution to the coordinator who will be responsible for merging data in one report to be sent to the European Commission.

Proper communication between partners is crucial for achieving the goals of the exchange. Ensuring such communication is one of the task of project management and is supervised by the project coordinator and workpackage leaders. Extensive use will be made of electronic communication platforms for communication and information sharing within the partners, dissemination of knowledge and overall co-ordination of the joint activities.

Working meetings to discuss the current issues inside workpackages will be held when a critical decision must be taken inside a workpackage or the issues under discussion are especially complex or important. To achieve integration between different workpackages workshops are organised in which all or part of the workpackages participants will take part. At the end of the three-years period of the programme a final working meeting will be held to discuss final results.

The first workshopx zxc is planned to be held within the 10 first months of the programme and will rotate round appropriate venues in partner's institutions in future months (see workpackages).

All partners will have unhindered access to the knowledge of other partners required for them to perform the planned tasks and open royalty-free access to facilities, except where specifically excluded in advance or where this justifiably endangers the legitimate exploitation plans of the partner owning the intellectual property. Intellectual property generated by the partners participating in the programme will remain the exclusive property of the partner or partners generating it.

The integration budget for this 3 year programme is based on the formula laid down by the EC and is estimated to be adequate to achieve the tasks specified. The funds requested will add considerable value to the core programme exchange as the projects behind it are already supported at a national level in each partner's country and will be sufficient to establish a durable, lasting and self-sufficient collaboration.

B 4 Impact

B 4.1 Relevance of the proposed partnership to the area of collaboration and for the European Research Area[2]

- Describe the partnership's contribution to the area of collaboration
- Describe the relevance of the exchange between the partner countries for ERA

There are four main categories of scientific resources among the different teams involved in this partnership: Synthesis of molecularly imprinted materials for sensing, synthesis of hybrid sol-gel materials for sensing, physico-chemical characterization of sensing materials and reliable sensor design and application. Efficient organisation and joint exploitation and improvement of these resources will be the main focus of the integration activities.
Synthesis of molecularly imprinted materials. UNIOVI has a large experience in the development of molecularly imprinted polymers, both with an acrylic based and using the sol-gel technology. The contribution of this partner is key in order to transfer this knowledge to the rest of partners through the synthesis of sol-gel imprinted materials for antibiotic optical sensing.
Synthesis of hybrid sol-gel materials. UNIKIEV has accumulated an important background on the synthesis and chemical modification of silica sol-gel materials. Hydrophobization, synthesis in the presence of structure-directed templates by the conventional sol-gel technology, embedding dyes, films preparation, etc are basic for the development of sensing films for formaldehyde determination/detection based on hybrid silica. On the other hand, UNIOVI has also experience in synthesis of new materials by a microwave-assisted method and by the hydrothermal approach. This knowledge is of importance in investigating the influence of the synthesis route on the sensing properties of the materials. UPS has recognized experience in the synthesis of dyes purposely devoted to sense a given analyte. Also, UPS has experience in the synthesis of dye-doped hybrid silica films for optical sensing. Contribution of the three partners, UNIKIEV, UNIOVI and UPS to the partnership is fundamental in order to exchange experience and background.
Physico-chemical characterization of sensing materials. UNIOVI has a huge scientific background in the characterization of materials using techniques such as X-ray spectroscopy, calorimetry, SEM, TEM, AFM, XPS. Also, has experience in the characterization of the binding properties of molecularly imprinted materials (using molecular spectroscopic techniques): binding constants, number of binding sites, isotherms, kinetics. The exchange of this knowledge with the rest of partners is crucial for a whole understanding of the recognition process in sensors.
~~UPMC~~ and ESPCI have an important scientific background in the characterization of materials using NMR solid- and liquid state spectroscopies, adsorption of gases, catalytic properties. The information provided by these techniques is key to understand the recognition process in sensors,

[2] Towards a European Research Area, version Brussels, 18 January 2000. COM (2000) 6

not only in the final material, but also during the pre-polymerization steps (e.g. during the arrangement of the polymer precursors around the template molecule in molecular imprinting). So, dissemination of this experience among the partners will enhance the arsenal of knowledge of the groups.
Reliable sensor design and application to real samples. UPS and UNIOVI has a recognized analytical background on the design of the sensing approach more adequate for real sample application. The proposed materials developed can be implemented as sensing layers in continuous flow-systems, as sensing strips, as arrays, etc. Also, they have experience on the previous sample treatment, absolutely necessary to perform the final analytical measurement. The analytical protocol and validation of the sensor are of key importance if they have to be applied in various systems for control of quality and safety of food products and waters. Therefore, the contribution of these two partners to the project is fundamental.
In conclusion, the contribution of all partners results in greater coherence to research activities and encourage the exchange of know-how and technologies
The success of the exchange program will contribute directly in the application of high-added value integrated approaches, combining analytical, organic and materials sciences and providing a general strategy for systematic design of novel knowledge-based materials with predefined properties that will allow development of stable, precise and low-cost systems for sensing. The exchange program is based on an integrated approach and combines the research and technological efforts of universities and research organizations, which is one of the accents of the IRSES program. On the other hand, the proposed exchange directly and explicitly addresses the research and technological goals of topic 5.1. "Greater mobility of researchers in Europe", the topic 5.3 "Greater place and role for women in research", 5.4. "Giving the young a taste for research and careers in science" and the topic 6.2 "Integration of the scientific communities of western and eastern Europe" of the ERA.

B 4.2 Potential to develop lasting collaboration with the eligible *Third country* partners

- Give a detailed overview over the measures taken to create or reinforce a lasting cooperation between the partners

The changes which have took place in Central and Eastern Europe have left science and technology in the region in a poor state. Despite the fact that a large research base still exists in these countries, it has not been explored to improve the competitiveness and quality of life of the region. Among the reasons at the core of this problem are: absence of funds to support research and lack of knowledge in patenting, licensing, finance and forming useful partnership. This exchange program is a driving force to develop lasting collaboration with UNIKIEV:
a) already previous collaborations with all the partners exist: Projects such as "Tailor's synthesis of new organo-inorganic hybrid materials with low dimensionality" (Main researcher Santiago García-Granda) funded by the Spanish Ministry for Science and Education or "Amorphous inorganic ion exchangers for monitoring and environmental protection" funded by NATO are some of the examples of the current collaboration between UNIOVI and UNIKIEV. UNIKIEV and UPS-TLSE have a joint research project (involving National Taras Shevchenko University of Kiev and laboratoir de Le synthesis et Physicochimie de Molecules d'Interest Biologique, UPS-TLSE) carried out under GDRI "Groupment Franco-Ukrainien en Chimie Moléculaire". UNIKIEV and EPSCI has also a lasting collaboration as reflected in the number of scientific articles they have published together in the last years.
b) such collaborations have resulted in joined publications and congress presentations:
c) work in the environment of universities represents an important and unique advantage for young researchers: The already established collaboration among the partners is intended to be reinforced by exchanging researchers among the institution and mutual support in the development of research projects. Spanish scientists are going to take advantage from Ukrainian experience in their routes of synthesis of sol-gel materials. In a similar manner, Ukrainian scientists are going to exploit the Spanish and French facilities for characterizing the materials and for checking new routes of synthesis. The possibility of performing hydrothermal synthesis at Spain will also reinforce collaboration between UNIKIEV and UNIOVI, as the devices required for such task are in Spain. Likewise, establishing a new research line about molecular imprinting in Ukraine will strengthen the relationship between UNIOVI and UNIKIEV, as the Spanish experience will be

indeed of great interest to Ukrainian scientists. Finally, it is important to say that this exchange may reinforce the links among the partners through joined dissemination of scientific results and promoting thematic workshops and seminars.
In conclusion, there is a high potential to develop a lasting collaboration with UNIKIEV.

B 5. Ethical Issues

Describe any ethical issues that may arise in their proposal. In particular, you should explain the benefit and burden of their experiments and the effects it may have on the research subject.

No ethical issues related with animal, human, military, privacy or developing countries are involved in this programme.
All partner's participants are treated fairly regardless of gender, race, colour, nationality, ethnic or national origin, religion, beliefs, age, disability, marital status or sexual orientation.

To ensure compliance with ethical principles, the Commission Services will undertake ethics audit(s) of selected projects at its discretion.
A dedicated website that aims to provide clear, helpful information on ethical issues is now available at:
http://cordis.europa.eu/fp7/ethics_en.html

ETHICAL ISSUES TABLE

(Note: Research involving activities marked with an asterisk * in the left column in the table below will be referred automatically to Ethical Review)

	Research on Human Embryo/ Foetus	YES	Page
*	Does the proposed research involve human Embryos?		
*	Does the proposed research involve human Foetal Tissues/ Cells?		
*	Does the proposed research involve human Embryonic Stem Cells (hESCs)?		
*	Does the proposed research on human Embryonic Stem Cells involve cells in culture?		
*	Does the proposed research on Human Embryonic Stem Cells involve the derivation of cells from Embryos?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

	Research on Humans	YES	Page
*	Does the proposed research involve children?		
*	Does the proposed research involve patients?		
*	Does the proposed research involve persons not able to give consent?		
*	Does the proposed research involve adult healthy volunteers?		
	Does the proposed research involve Human genetic material?		
	Does the proposed research involve Human biological samples?		
	Does the proposed research involve Human data collection?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

	Privacy	YES	Page
	Does the proposed research involve processing of genetic information or personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		
	Does the proposed research involve tracking the location or observation of people?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

	Research on Animals	YES	Page
	Does the proposed research involve research on animals?		
	Are those animals transgenic small laboratory animals?		
	Are those animals transgenic farm animals?		
*	Are those animals non-human primates?		
	Are those animals cloned farm animals?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

	Research Involving Developing Countries	YES	Page
	Does the proposed research involve the use of local resources (genetic, animal, plant, etc)?		
	Is the proposed research of benefit to local communities (e.g. capacity building, access to healthcare, education, etc)?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

	Dual Use	YES	Page
	Research having direct military use		
	Research having the potential for terrorist abuse		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

Annexes

Annex 1. Justification for Community contribution towards *third country* partner costs.

As far as ICPC countries and countries covered by the European Neighbourhood policy, are concerned, a Community contribution towards travel and subsistence for these partners may be envisaged. The justification should be presented here, with focus on the benefits of such for the collaboration.

The changes which have took place in Central and Eastern Europe have left science and technology in the region in a poor state. Despite the fact that a large research base still exists in these countries, it has not been explored to improve the competitiveness and quality of life of the region. Among the reasons at the core of this problem are:

a) absence of funds to support research: dramatic cuts in R&D budgets (75% coverage) and the absence of venture capital to support star-up companies has resulted in a significant decrease in finance for resarch
b) lack of knowledge in patenting, licensing, finance and forming useful partnership
c) low capability of the national industry to absorb innovations: the essential part of national incomes if from low-technology and cheap commodity goods
d) lack of awareness of what is available and an absence of funds to implement innovation. The researchers need to acquire and adopt a greater understanding of risk and business skills.

This exchange program is a driving force to minimize those problems.

Annex 2.

CODES AND LECTURES OF GANTT SECONDMENTS CHART

CODES:

Beneficiary 1	UNIOVI
Beneficiary 2	UPS
Partner 3	UNIKIEV
Beneficiary 4	ESPCI
Beneficiary 5	~~UPMC~~

CODE	NAME	TOTAL SECONDMENTS
Early researcher A	PhD student Alejandro Simón de Dios	9
Staff researcher B	Dr. Alfonso Fernández-González	2
Staff researcher C	Dr. Rosana Badía-Laíño	1
Staff researcher D	Dr. Sergiy Khainakov	12
Research Professor E	Prof. Dr. Rubén García Menéndez	1
Staff researcher F	Dr. Jose Manuel Montejo-Bernardo	3
COORDINATOR	Prof. Dr. Santiago García Granda	0
Research Professor H	Prof. Dr. Marta Elena Díaz-García	1
Staff Researcher I	Dr. Marie Rose Mazière	10
Research Professor J	Prof. Dr. Michel Baltas	1
Early researcher K	PhD Student Anastasiya Motorina	12
Staff researcher L	Dr. Oksana Tananaiko	6
Early researcher M	PhD Student Tatiana Rpozhanchuk	12
Staff researcher N	Dr. Tatiana Kovalchuk	6
Research Professor O	Prof. Dr. Vladimir Zaitsev	1
Research Professor P	Prof. Dr. Hocine Sfihi	1
Staff researcher Q	Dr. Bruno Bresson	5
Staff researcher R	Dr. Guenin Erwann	6
~~Early researcher S~~	~~PhD Student Zora Elberrichi~~	~~6~~
~~Staff researcher T~~	~~Dr. Jean Baptiste D'Espinose~~	~~5~~
~~Research professor U~~	~~Prof. Dr. Jacques Fraissard~~	~~1~~

Total secondments at:

UNIOVI	33
UPS	11
UNIKIEV	31
ESPCI	16
~~UPMC~~	~~10~~

Total months devoted to tasks:

Task 1.1	9	Task 2.1	8
Task 1.2	3	Task 2.2	4
Task 1.3	3	Task 2.3	4
Task 1.4	4	Task 2.4	3
Task 1.5	1	Task 2.5	1
Task 1.6	WORKSHOP	Task 2.6	
WORKSHOP			
Task 3.1	6	Task 4.1	2
Task 3.2	5	Task 4.2	6
Task 3.3	8	Task 4.3	6
Task 3.4	9	Task 4.4	3
Task 3.5	6	Task 4.5	1
Task 3.6	1	Task 4.6	1
Task 5.1	3		
Task 5.2	3		
Task 5.3	1		
Task 5.4	WORKSHOP		
Task 5.5	Final Meeting		

ENDPAGE

PEOPLE
MARIE CURIE ACTIONS

International Research Staff Exchange Scheme

Call: FP7-PEOPLE-2009-IRSES

PART B

"SOLGENSENS"