Post-doctoral position MAISOE - CIRIMAT

Context
The realization of autonomous and multidisciplinary observatories is a challenge in the domain of environmental monitoring. It requires reliable, precise, and miniaturized in situ instrumentation.

This work will be realized within the framework of MAISOE project (Microlaboratoires d'Analyses In Situ pour des Observatoires Environnementaux) which is supported by the STAE (Sciences et Technologies pour l'Aéronautique et l'Espace, www.fondation-stae.net) Scientific Foundation. The general project consists in the development and validation of microanalysis systems in situ with the aim to analyze in real time concentrations and speciation of nutritive or toxic elements in oceans or in continental waters. Nine research groups from seven laboratories will work together for 4 years.

One objective of MAISOE project is to develop sensors allowing the in-situ continuous detection / quantification of silicates in sea water. In this aggressive media, the sensors will have to be protected against corrosion and biofouling.

Description of the Position
The research project deals with metalorganic chemical vapour deposition (MOCVD) of composite coatings made of metallic nanoparticles (Ag, Cu) dispersed in an oxide matrix (alumina) in order to obtain an original bifunctionality: the combination of the bactericide properties of the metallic nanoparticles with the corrosion-barrier effect of Al₂O₃.

Alumina deposition is well optimized and shows promise to meet the specifications for the protection of sensors against corrosion. The dispersion of metallic nanoparticles needs to be investigated regarding different ways: diffusion of a metallic sublayer, co-deposition, liquid injection…

The post-doctoral project will deal with the processing and the optimisation of the composite coatings Al₂O₃/metallc nanoparticles. The optimization of the process will be enabled by the characterisation of the coatings in terms of structure, morphology and functions (corrosion resistance, bactericide effect). The study will also focus on the stability of the interface, stresses accommodation in order to avoid cracks as well as inertia of the coating.

Required Competences and Skills
A PhD in the field of Material Science and Engineering with focus on chemical vapor deposition and surface characterizations.

The post-doctoral position will start either in April or May 2010 for 18 months.
The position will remain open until filled. Monthly salary: from 2200 € to 2500 € depending on experience.

Contact
Candidates should send CV, cover letter, and contact information for two reference persons to Constantin Vahlas (constantin.vahlas@ensiacet.fr).

Description of the Laboratory
The post-doctoral project will take place in Toulouse (France) at CIRIMAT (Material Research and Engineering Interuniversity Centre).

CIRIMAT was labeled "Carnot Institute" in 2006 as a national acknowledgement of the quality of its contractual research. It is a joint laboratory between CNRS and two academic institutions in Toulouse, the Paul Sabatier University (UPS) and the National Institute of Toulouse (INPT). It focuses on high surface to volume ratio material. CIRIMAT's staff is composed of 100 state employees, 84 PhD students and post doc, 14 contractual employees.

The proposed project will be performed within the “Surfaces: reactivity and protection” (SURF) group of CIRIMAT. Research activities in SURF are focused on thin films (metals, ceramics polymers) processing by various techniques such as CVD (and derivative techniques) or electrodeposition. Depending on their nature (in terms of composition, morphology, structure), these coatings provide specific functionalities to the substrate: mechanical optical, catalytic, thermal barrier or corrosion protection ones. To elucidate the mechanisms involved in the surface reactivity, the group benefits from theoretical calculations related to the physical-chemistry of surfaces and of gas/solid interfaces (DFT, Monte Carlo). The thin films are characterized by conventional or more specific techniques (zetametry, high temperature resistivity, global or local electrochemical impedance).