

Open Post-doc position

Nanocomposite coatings for piezoresistive strain sensors

Keywords : functional coating, nanoparticles, percolation, transport properties, sol-gel, hybrid materials

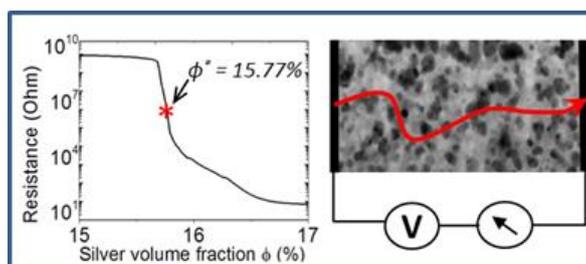
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Duration and starting date: 1 year with possible extension, starting as soon as possible end 2016-2017

Host laboratory : [Solid State Chemistry Group](#), [Condensed matter Physics Laboratory](#)

Project summary : Since a few years, we are developing original metal dielectric nanocomposite coating based on the dispersion of silver nanoparticles within a sol-gel matrix. The silver particles are produced in-situ inside the film through a photocatalytic reduction of silver salt at the vicinity of TiO₂ nanoparticles dispersed in a mesoporous silica matrix. The main advantage of the process is that it enables a perfect control of the metal loading through the irradiation dose of UV light monitoring the photocatalytic process of reduction. This allows load the film with silver particles at a volume fraction corresponding to the percolation of the nanoparticles network, i.e. just at the insulator to metal transition. This opens the way toward investigations of physical properties at the percolation, a field of materials sciences that remains largely unexplored.

Appart from academic research, we are studying the application of such materials as piezoresistive strain sensors. The basic idea is that application of small deformation of the composite at the percolation leads to huge variation of conductivity. First investigations open the way toward the development of highly sensitive sensors.



Scheme showing the insulator to metal transition and the percolating metal particle network.

The aim of the present project is to work on the active nanocomposite formulation and structure in order to have a better understanding of the conduction properties within the nanoparticle network, but also to improve the sensitivity of the sensor toward higher strains. This should be investigated by considering the extension of the elaboration process toward softer inorganic/organic or hybrid polymer matrices.

Bibliography and further information : [link](#)

Scientific background : PhD and 1 or two years of experience in the field of materials chemistry and soft chemistry routes (or liquid routes) to functional inorganic or organic/inorganic coatings.

Location : PMC lab is located on the campus of the Ecole Polytechnique/Université Paris saclay. It is about 20 km south west of Paris. Accomodation can be either in Paris (about 40 min. by train) or in the neighborhood. [More information on Ecole Polytechnique and its location](#)