Title: Graphene coating for corrosion protection of steel
Duration: 12 (Financial support from European project)
Starting date: 1st Mai 2019
Location: Ecole Polytechnique-Palaiseau, IFSTTAR-Marne La Valée
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Context:

The deterioration or the corrosion of metal structures is recognized as one of the most serious problems in the modern technological world as it results in the loss of hundreds of billions of dollars in damage each year [1]. Many studies have determined that the annual metal deterioration and corrosion costs range from approximately 1 to 5 percent of the Gross National Product of each industrialized nation [1]. Intense efforts have been made to find protective coatings that inhibit the process of metal corrosion. Corrosion can be inhibited or controlled by coating with organic layers [2], paints or varnishes [3], polymers [4], formation of oxide layers [5], anodization [6], chemical modification [7] and coating with other metals or alloys [8]. However, these protective coatings often also modify the physical properties of the metals being protected. In addition, the protective coating also changes the dimensions of the materials due to the thickness of the coating. It can change the appearance and the electrical properties of the metal surface, and often decreases the electrical and thermal conductivity.

In this work, **we aim to study a new generation of protective coating based on nanostructured carbon materials to improve corrosion protection.** Graphene has attracted tremendous attention from the scientific community due to the amazing properties it exhibits for a wide variety of applications. Graphene, can be considered as a highly promising new coating material for corrosion inhibiting coatings, because of its impermeability and hydrophobic properties [9], which create a barrier against gases and liquids when it is in a corrosive environment. Graphene is considered as an environmentally friendly low cost coating, which is chemically and thermally stable [10], as well as inert under different atmospheres [11]. We are particularly interested in studying the properties of graphene, deposited by Langmuir Blodgett or Doctor Blade methods, as an effective anticorrosion coating for steel.

In the frame of the European project "DESDEMONA" between LISIS, IFSTTAR (http://www.lisis.ifsttar.fr/) and LPICM, Ecole Polyetchnique (https://portail.polytechnique.edu/lpicm/en) we are seeking for a talented postdoctoral research fellow. The hosting laboratories possess strong expertise on the synthesis and characterization of these materials and their applications. The candidate will investigate the both aspects, materials elaboration and its application on corrosion, in close collaboration with the partners.

Work description:

The Postdoc student will be in charge of:

- Study of deposition of re-assembled thin films graphene by Langmuir-Blodgett or Doctor Blade on steel surface.
- The microstructural and the spectroscopic characterization before immersion in corrosive medium.
- Electrochemical characterization. It includes a study of ionic transfer of corrosive species in different media simulating different corrosion scenario. The effect of the nature and the variation in concentration of the corrosive species as function of the temperature of the medium.
- The microstructural characterization of corroded substrates. The study of the interface graphene/metal before and after immersion into different corrosive media simulating accelerated corrosive media.

Candidates profile:

- Doctor in materials sciences or chemistry or physical chemistry.
- Strong background in electrochemical characterization.
- Skills in microstructural and spectroscopic characterization techniques is preferred.
- Applicants must be self-driven, highly motivated and able to work autonomously towards the objectives of the project.

- Excellent interpersonal and communication skills.

The interested candidates should contact rapidly either Dr. F. Bouanis or Dr. Didier Pribat or Dr. Abderrahim Yassar with a full CV and 3 reference letters.

Bibliography:

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