Laboratories :

Institut des NanoSciences, Campus Jussieu, Paris, France, http://www.insp.jussieu.fr/-Oxydes-en-basses-dimensions-.html

Arcelor-Mittal Research Center, Maizières-les-Metz

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Steel and corrosion: towards a design of interfaces at atomic scale?

Galvanization is a well-known method of protection of steel plate against corrosion. The requirements of car weight relief push steel industry towards more complex steel grades with high contents of alloying elements. They form oxides at the surface during recrystallization annealing despite the reducing atmospheres of furnaces and harm the adherence of the protective zinc film.

In this context, this PhD aims at exploring, at a fundamental level, ways to improve the adhesion at the interface of zinc with α-Al_2O_3(0001) single crystal. A better understanding of adhesion mechanisms at atomic scale is foreseen: role of transition metal buffer layers, hydroxylation/polarity, interfacial oxidation, and influence of environment. The originality of the research program is to rest on back and forth interactions between *ab initio* numerical simulation (running post doc) and experiments to identify conditions which allow a control of the interfacial energetics. The experiments will examine *in situ* the growth laws, the thermal stability, the structure and the chemistry of Zn/(Ti,Cr)/Al_2O_3 stacks and their ripening during exposure to gases.

This work is developed in the framework of a running collaboration between INSP and the research center of Arcelor-Mittal with the support of the Laboratory of Excellence MATISSE which brings together academic partners in Paris Centre.

Techniques in use: surface analysis and growth under ultra-high vacuum, atomic force microscopy photoemission, electron diffractions, optical spectroscopy, thermal desorption, synchrotron radiation

Applicant skills: master in physics or chemistry of materials, with knowledge in physico-chemistry of surfaces. Taste for experimentation.

Funding: Grant from the Excellence Laboratory Matisse (http://www.matisse.upmc.fr/en/index.html), ~1500€/month, 3 years starting from autumn 2015