



Al-based alloyed steel: from selective oxidation to wettability by zinc

Galvanization is a well-known method of protection of steel against corrosion. The requirements of car weight relief push steel industry towards more elaborated steel grades with improved mechanical properties and high contents of light alloying elements. They form oxides at the surface of steel sheets during recrystallization annealing despite the reducing atmosphere of furnaces and prevent the adherence of the protective zinc film as this metal poorly wets them.

In this industrial context, a joint collaboration is running between an academic partner (Institut des NanoSciences de Paris, CNRS/Sorbonne University) and the Maizières-les-Metz research center of ArcelorMittal, a world-wide steel manufacturer. By working on tractable model systems, the idea is to find routes to circumvent this adhesion problem. In the case of the Fe-Al alloy, the present project aims at understanding the role of environment and crystalline orientation in the switch from external to internal oxidation and the impact of the formed oxides on the wettability by zinc. This study will combine a surface science approach beyond the pressure gap on single crystals and a material science approach on model alloys annealed in controlled atmosphere.

This 2-years post-doc position will be a good opportunity for the applicant to get familiar with researches at the forefront of fundamental and applied fields and to get acquainted with the research engineer job in a large company.

Techniques in use: surface science analysis under ultra-high vacuum (XPS, STM/AFM, LEED, TPD, UV-vis spectroscopy); X-ray diffraction on thin films (GIXRD, XRR); wettability measurements; SEM/TEM analysis

Applicant requirements: PhD in physics/chemistry of materials, with some knowledge in physico-chemistry of surfaces. Taste for experimentation. PhD obtained between 2019 and 2021 (mandatory).

Funding: 2 years CNRS contract starting before end of 2021. Funding is subject of acceptance of the project record and applicant CV by ANR in the frame "Plan de Relance" of French state.

Laboratories:

(60%) ArcelorMittal Research Center, Maizières-les-Metz, France

(40%) Institut des NanoSciences, Paris, France, <http://www.insp.jussieu.fr/-Oxydes-en-basses-dimensions-.html>

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