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High entropy alloy corrosion studied in acidic environment by electrochemical and surface science techniques

Vivier, V.(1);
(1) Sorbonne Université;

Keynote: High-entropy alloys (HEAs) are an emerging class of materials with highly promising properties, including high strength and ductility, improved fatigue resistance, fracture toughness, and thermal stability. The composition of HEAs can be varied over a wide range, allowing for precise tailoring of their properties to meet specific requirements. HEAs are therefore highly versatile thanks to their flexible design, however, their corrosion susceptibility and the origins of their enhanced passivity remain under investigation. In this presentation, we will present results on the corrosion behavior for various HEA compositions. In particular, we will focus on the typical Cantor alloy, which consists in a mixture of 5 elements (Cr,Mn,Fe,Co,Ni) in equimolar proportion. A huge amount of works has already been devoted to the study corrosion resistance of alloys in sulfuric acid1 or in chloride containing solutions2,3. For the latter, the study of the pitting propagation remains challenging since this kind of corrosion initiates as a stochastic process. However, we will show the advantage of conventional electrochemical techniques such as impedance spectroscopy to investigate the corrosion /dissolution mechanism of the Cantor alloy in acidic solution. A specific attention will be paid to the effect of Cl-. Such an approach can be advantageous combined to in situ ICP analysis and ex situ XPS study to investigate the dissolution mechanism and the formation of the passive film. In a second step, results using local electrochemical techniques will be presented as a promising tool to generate single pits and study their evolution.