Surface chemistry of CMAs

Marie-Geneviève Barthés-Labrousse*

Institut de Chimie Moléculaire et Matériaux d'Orsay, CNRS UMR 8182,

Bâtiment 410, Univ. Paris-Sud, 91405 Orsay Cedex, France

*marie-genevieve.barthes@u-psud.fr

The interest in studying CMAs surface chemistry comes from their specific electronic structure, which is related to the existence of highly symmetric clusters which decorate the giant unit cells and could affect interactions of the surface atoms with surrounding atoms and molecules. In spite of this characteristic feature, a limited number of studies have been devoted so far to the chemical reactivity of CMA surfaces. Moreover, although the number of possible combinations of metal constituents should give rise to the formation of a huge variety of CMAs, most investigations have been performed so far on Al-based compounds.

Adsorption of simple molecules on CMAs surfaces has been performed with the idea to form molecular ordered complex overlayers, to understand oxidation mechanism of these materials and as a first step to understand their catalytic properties [1].

In particular, a number of studies have been devoted to oxidation properties of CMAs, due to the excellent oxidation and corrosion resistance which was initially reported and to the fact that many promising properties of these alloys, such as their low surface energy and friction coefficient, their optical emissivity... can be affected by the nature and thickness of the oxide layer formed on the surface. However, most of the work is related to the oxidation characteristics of Al-rich complex alloys in air or oxygen. Surprisingly enough, very little work has been done in the field of aqueous (wet) corrosion.

It has also been shown that CMAs are very promising catalytic materials as they can present high activity and selectivity, they can be stable up to high temperature and, thanks to their brittleness, they can be easily crushed into powders at room temperature.

This presentation will illustrate some aspects of the surface chemistry of Al-based CMAs, in the field of oxidation, corrosion and catalysis. The similarities and differences that CMAs can present with respect to more classical metallic alloys in terms of surface reactivity will be emphasised.

[1] See for example "Complex Metallic Alloys", Ed. J-M. Dubois and E. Belin-Ferré, Wiley-VCH, 2011