SUBJECT PROPOSAL FOR ERASMUS STUDENTS

Resistance to corrosion of composite material:
Catalytic oxide layers coated on metallic foams

The usefulness of catalytic exhaust pipes for abatement of pollution coming from cars is well-established. The active elements (precious metals) are deposited on an alumina layer coated on ceramic or metallic monoliths. This configuration allows efficient heat and mass transfers, so that the consumption of fuel is not enhanced.

Recently, nanometer-thick layers of titanium dioxide (TiO_2) were directly coated on the stainless-steel (SS) walls of structured reactors or on metallic foams (size of pores 200-500 μm) (Fig.). To enhance the holding, one way is to graft an intermediate layer on SS with a primer constituted by silica by means of plasma-enhanced chemical vapor deposition (PA-CVD).[1,2,3]

The aim is to prepare the samples on structured (e.g. engraved channels) plates and foams (various substrates : SS, FeCralloy, glass) and to study the thermal and chemical stability of the coatings when varying temperature and using gaseous reactants. A furnace will be used in controlled atmosphere (hydrocarbon, oxygen, hydrogen). The composite solids will be analysed before and after reaction by several techniques techniques (X-ray diffraction, Raman and infrared spectroscopies, scanning electron microscopy, X-ray photoelectron spectroscopy, EPMA, etc.). The resulting catalysts are intended to be used in exothermal reactions like photocatalysis (if the substrate is glass) or oxidation of hydrocarbons to valuable products (sustainable chemistry).

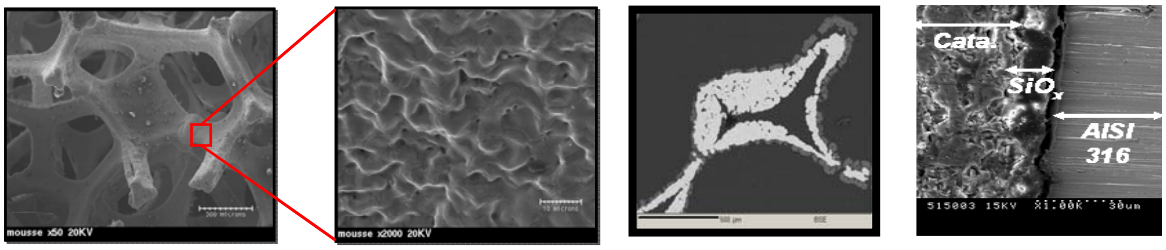

Fig. (left to right) :SS foam; b) magnification ; c) SiO_2 deposit; d) example on SS plate

Keywords: composite material; catalytic foams;corrosion; physico-chemical analyses

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