Electrochemical and analytical assessment of "smart" nanostructured thin organic coatings for corrosion protection of metallic substrates. Corrosion inhibithion vs. self-healing ability

Fátima Montemor

Abstract:

In the last years a considerable effort on the development of effective systems for corrosion protection has been noticed. The need of effective, smart and tailored anti-corrosion systems, presenting environmental friendliness has been an important driving force for such research.
Hybrid thin organic coatings are very attractive for the formation of passivation layers or for pre-treatment formulations with application in different metallic substrates like galvanised steel, magnesium alloys and aluminium. These hybrid films generally provide good barrier effects, but they do not provide corrosion inhibition after corrosion onset. In order to overcome such drawback the thin coating can be doped with species with corrosion inhibition properties. These can be inserted in nano capsules or fixed on nanoparticles or carbon nanotubes, among other possibilities.
The present work aims at highlighting the recent trends in the development of nanostructured thin organic coatings doped with corrosion inhibitors for corrosion protection of metallic substrates. Attention will be devoted to the "green" rare-earth corrosion inhibitors used either as additives or combined with different supports like nanoparticles or carbon nanotubes. The corrosion inhibition performance as well as the possibility of self-healing will be discussed. Different techniques like conventional electrochemical techniques (d.c. polarisation and a.c impedance spectroscopy), new electrochemical localised techniques (scanning vibrating electrode technique and scanning electrochemical microscopy), surface analysis (X-ray photoelectron spectroscopy and Auger electron spectroscopy) and microscopic techniques (atomic force microscopy and scanning electron microscopy) are employed to better understand the behaviour of these smart thin organic films applied on different metallic substrates.

Palavras Chave: self-healing; inhibitors, electrochemistry , nanotechnology

[1] Doutor – Instituto Superior Técnico
[2] Professor – Instituto Superior Técnico
[3] **PHD,** Instituto Superior Técnico, ENIT