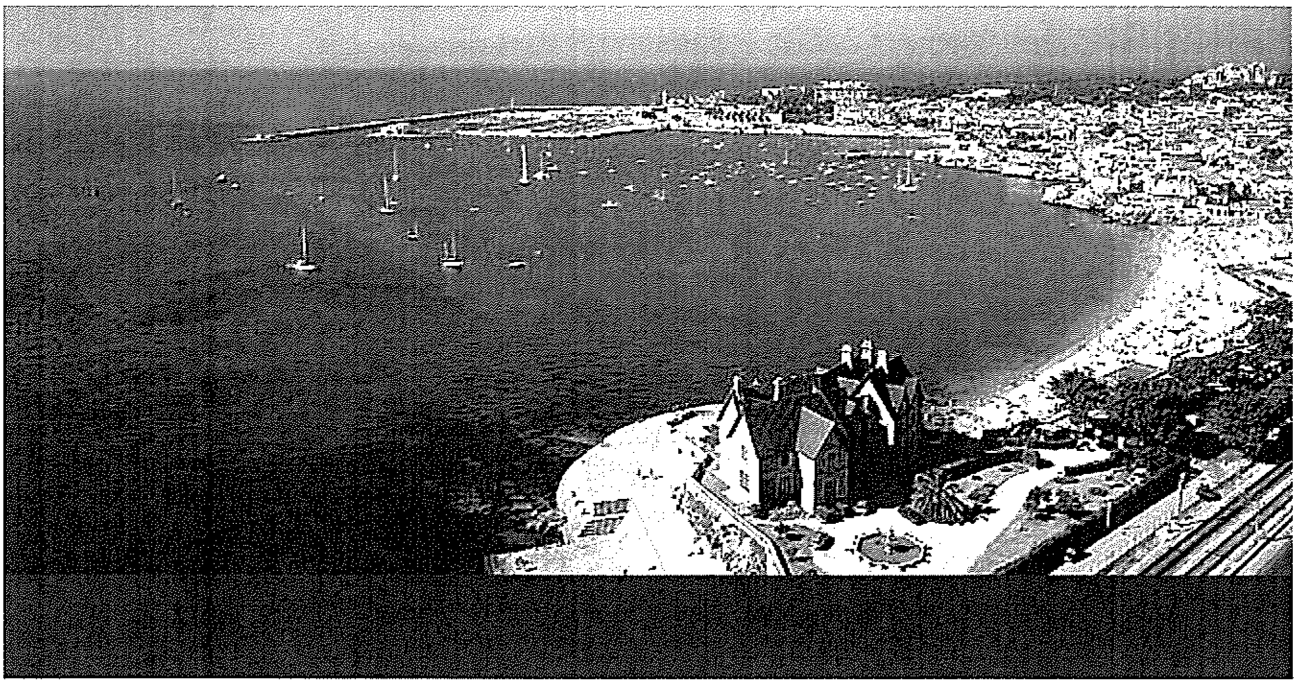

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BOOK OF ABSTRACTS

Corrosion Protection of AA2024 by Sol-gel Coatings Modified with Mixed Ce(III)- and MoO_x- loaded Zeolites

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The most common strategy to provide self-healing ability to coatings is to use micro- or nano-containers that can serve as host reservoirs for corrosion inhibiting species. Such containers are uniformly distributed in the passive matrix keeping the healing agent in a "trapped" state, thus avoiding undesirable interaction between the active component and the passive matrix. When the coating is locally damaged, the micro- or nanocontainers respond to changes in local environment and release the encapsulated active material to heal corrosion.

Zeolites are crystalline aluminosilicates wherein the structure electronegativity is compensated with the presence of cations from group IA and IIA such as sodium, potassium, magnesium and calcium. Structurally, zeolites are complex, crystalline inorganic polymers based on an infinitely extending three-dimensional, four-connected framework of AlO_4^{5-} and SiO_4^{4-} tetrahedra linked to each other by the sharing oxygen ions. The zeolite hydrophobicity and hydrophilicity also strongly depend on the aluminum content, which affect the adsorption of polar and apolar molecules on the zeolite. Thus, besides structure, the silicon to aluminum ratio determines the zeolite performance.

In the present work, we compare the corrosion protection efficiency of the sol-gel coatings modified either with MoOx-enriched zeolite microparticles and Ce-enriched zeolite microparticles with the coatings modified with the mixture of Ce and MoOx-enriched zeolite particles. The sol-gel coating modified with both, Ce- and MoOx--enriched zeolites, has around 2 wt% of Ce(III) and 0.2 wt% of Mo entrapped in the zeolite structure. Corrosion behaviour was evaluated by Electrochemical Impedance Spectroscopy (EIS) and Local Electrochemical Impedance Spectroscopy (LEIS). The zeolite microparticles and the sol-gel modified coatings were characterized by Scanning Electron Microscopy coupled with Energy Dispersive Spectroscopy (SEM/EDS).

The presence of both MoOx- and Ce-enriched zeolites improved the protective behaviour of sol-gel coatings compared to the coatings modified with only CeNaX or MoOxNaX zeolites. The adsorption of chloride ions significantly increased in the presence of zeolite loaded with MoOx by ion exchange. On the other hand, the adsorption of cations ($Mn^{2+}$and Cu^{2+}) involved in the corrosion process was observed for Ce-enriched zeolites in response to the release of Ce(III) species. Moreover, Ce(III) and MoO_4^{2-} ions are recognized as aluminum corrosion inhibitors. Thus, the presence of the two types of zeolites leads to a better performance of corrosion protection.

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