Synthesis and characterization of epoxy coating incorporated with EDDS intercalated $Zn_2 - Al$ layered double hydroxide (LDH) on carbon steel

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Context

Corrosion Protection (Carbon Steel)

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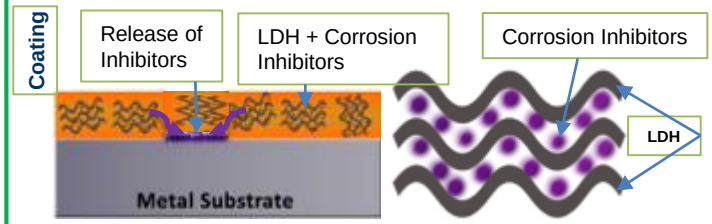
Passive Barrier Protection (Epoxy Coating)

Active Corrosion Inhibition (Inhibitors Intercalated in LDH)

Schema showing two modes of corrosion protection

Protective coating prevent corrosive species from reaching the coating/substrate interface

LDHs acts as a containers for corrosion inhibitors



Aims: To expand our knowledge on corrosion and how to develop an improved coating system for corrosion protection of carbon steel through

- Evaluation of barrier properties of coating
- Quantified the water uptake
- Determined the corrosion mechanism on the substrate and the inhibition effect as fillers

Method and tools

Materials Synthesis

- Inhibitor-intercalated Layered double hydroxide (LDH)
- Incorporation of LDH containing inhibitor into Epoxy Coating
- Elaboration of the coating with/without LDH on the carbon steel substrate

Characterization Technique

Electrochemical impedance spectroscopy (EIS):

- Electrochemical behavior evaluation
- Dielectric properties determination at the metal/coating/electrolyte interfaces
- Water uptake kinetics

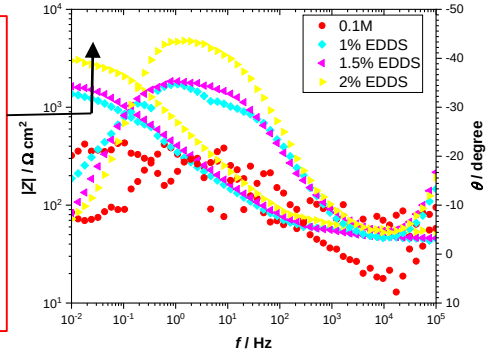
Complementary techniques

- Contact angle measurement: hydrophobic/hydrophilic property
- SEM, XRD, FTIR analysis: Surface Characterizations to study the microstructures
- UV-vis spectroscopy: inhibitor release study
- DVS on free films

Expected Results

- Successful intercalation of EDDS in $Zn_2 - Al$ LDH
- Mechanism of EDDS release from LDH
- The effect of EDDS and its efficiency in corrosion protection
- Correlation between free films and coated system
- Change in the composition of the epoxy coating due to the presence of fillers and water uptake
- Improved the protection of carbon steel by incorporation of LDH-EDDS in Epoxy matrix

increase in corrosion resistance due to the release of EDDS



EIS Diagrams for bare carbon steel electrode for three LHD-EDDS concentration after 2h of immersion in 0.1M NaCl

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