PARTICLE LEACHING FROM POLYMERIC COATINGS

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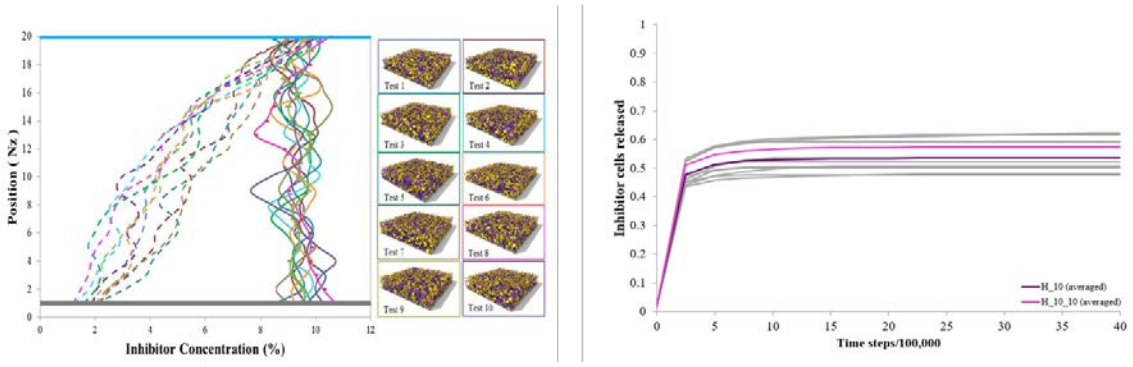
Understanding the microstructure of polymeric coatings used for active corrosion protection and the leaching mechanism of corrosion inhibitors can provide the tools to develop more environmentally friendly, sustainable and effective coatings. In this work, we used a combined experimental and simulation approach to first identify the main features that affect the corrosion protection to then develop a model that will allow exploring the parameter space to develop better understanding on the structure-property relationships and inform formulator of the desirable features in the coating. As an example, we focus on the leaching rate of inhibitors from coatings, using lithium carbonate as the model corrosion inhibitor. We show that Celular Automata simulations are able to describe the leaching from coatings and we explore the effect of different features, such as pigment volume concentration, solubility rate, and coating heterogeneity. Figure 1 shows an example of a collection of model coatings with 10% volume concentration of inhibitors, and the reproducibility of the structural properties as well as the release profiles.



(a) (b)

Fig. 1. (a) Reproducibility of composition profile of inhibitor particles in a model polymeric coating, where the inhibitor concentration is 10% where the solid lines represent the total concentration and the dashed lines the concentration corresponding to the percolated inhibitor particles; and (b) is the calculated inhibitor release profile for the individual coatings (grey), a coating formed by two thinner layers of the same composition (pink) and the average release profile (purple).

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