Abstract Submitted
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Nanoscale Assessment of Water Incursion to the Metal/Coating Interface[1] HYUNGJIN LEE, Dept. of Polymer Science, The University of Akron, JIM BROWNING, Spallation Neutron Source, ORNL Neutron Science, MARK FOSTER, Dept. of Polymer Science, The University of Akron — While a great deal of research on macroscopic corrosion phenomena has been done and an empirical knowledge of effective corrosion mitigation strategies is available, a fundamental understanding of many nanoscale aspects of corrosion or precorrosion processes at metal interface is lacking. Neutron reflectometry (NR) can be used to nondestructively determine depth profile of a substance near an interface with a resolution of 1-2 nm. Key precorrosion phenomena that we have focused on are ingress of small molecules such as water and salt into coating or coating/metal interface. To simulate a practical precorrosion process, an in situ experiment in which the sample is in the presence of water vapor can be performed. Samples of a thin epoxy coating containing siloxane on an aluminum substrate having a native oxide have been studied by NR. Composition depth profile of water at coating/oxide interface can be inferred using a comparison of the data from samples under dry and humid conditions. We have shown that water incursion along coating/metal interface is fast compared to incursion through face of coating. Also, our work has provided evidence that, with a more highly crosslinked coating, after a small amount of water has entered along the interface water incursion slows dramatically.

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