Evaluation of Corrosion Prevention Compounds and the Understanding of Their Function Inside Aircraft Lap Joints

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Corrosion prevention compounds (CPC) are materials that can both prevent new corrosion sites from forming as well as suppress corrosion that has initiated. They are widely used on aircraft as a relatively inexpensive way of protecting against corrosion at compromised areas of the coating systems and in occluded regions.

In this work, the performance of CPC on boldly exposed AA2024-T3 and AA7075-T6 was evaluated with electrochemical impedance spectroscopy (EIS). This work demonstrated the reasonable level of protection provided by CPC for aluminum alloys and the ability of parameters derived from EIS measurements to both assess and predict CPC performance on these aerospace materials. Excellent protection was exhibited by CPC-coated surfaces with interfacial impedances above 0.1 Mohms-cm^2. A method that predicts the long-term performance of CPC using parameters extracted from short-term test data was also developed.

An important characteristic of CPC is its ability to wick into occluded regions, such as crevice and lap joints on the aircrafts, to provide certain degree of protection. In the present work, the wicking rate of the CPC was determined using EIS. The effect of the surface tension of the lap joints and the gap geometry on the wicking ability of CPC will be combined with the electrochemical results to provide a comprehensive understanding of CPC behavior inside occluded regions.