

## Developing Hybrid Coatings for High-Temperature Corrosion Protection

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**Abstract** Anti-corrosive high-temperature coatings are crucial for protecting assets exposed to elevated temperatures, such as pipelines and ship exhaust stacks. These settings require extensive surface coverage and benefit from versatile organic coatings that are easier to apply and generally offer better corrosion resistance than less flexible inorganic alternatives. However, organic resins, such as phenyl-methyl siloxane, suffer from severe degradation at temperatures above 750 °F, significantly diminishing their protective capabilities.

To overcome this limitation, we have developed an organic-inorganic hybrid coating system. This innovative approach utilizes a dual film formation process, combining the primary organic film former (a polysiloxane resin) with inorganic oxide mixtures as a secondary high-temperature film former. This hybrid system aims to harness the advantages of both materials, ensuring enhanced durability and heat resistance.

We have characterized the barrier properties, surface morphology, and chemical composition changes of the coatings at various temperatures (800 °F, 1000 °F, and 1400 °F) using electrochemical impedance spectroscopy (EIS), high resolution digital optical microscopy, and Fourier transform infrared spectroscopy (FTIR).

This new hybrid coating approach not only enhances the heat resistance but also maintains superior corrosion protection at extreme temperatures, providing a promising solution for industries requiring high-performance coatings.

**Keywords:** *Corrosion, High Temperature, Coatings, Hybrid, polysiloxane*

### Reference

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