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Editorial on Coatings

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Coatings have always held a special role in high-temperature materials as a potential opportunity to extend performance or enhance functionality. The traditional oxidation- or corrosion-resistant coating is essential to the success of many high-temperature structural materials by increasing the operating temperature or lifetime in environments that might contain multiple oxidants or deposits. The development of thermal barrier coatings (TBCs) nearly 50 years ago provided both corrosion and thermal protection in the hot section of gas turbines using both a metallic bond

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coating and a low thermal conductivity ceramic top coating. These coatings are now essential in the hot section of gas turbines to achieve high efficiency. More recently, the protective role of coatings has been extended to include inhibiting volatilization of the thermal grown oxide in the presence of H₂O and/or O₂. This can include environmental barrier coatings for Si-based ceramics in turbine environments or, at lower temperatures, coatings to prevent Cr loss. This is a particular concern for solid oxide fuel cells or electrolyzers/electrolysis cells (SOFC/SOEC) where volatilized Cr can deposit in other areas and poison the electrochemical functionality.

The papers presented in this section represent a range of applications including the traditional protection of high-temperature materials—in this case Mo-based alloys. The study of TBCs has progressed over the past 25 years, and the current contributions investigate the subtleties of coating morphology on performance and the complex interaction between Ca-Mg-Al-Si (CMAS) oxide deposits with the ceramic top coating. The remaining papers consider coatings of various complexity and deposition methods to inhibit Cr poisoning in SOFC/SOEC applications for clean energy applications.

The following seven papers are contributions from the coating session held at the 11th International Conference on High-Temperature Corrosion and Protection of Materials (HTCPM2024), 9–14 June, 2024, in Les Embiez, France.

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