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Editorial on Modeling, Prediction and Simulation

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The optimization of alloy performance, in particular with regard to durability in harsh environments, represents a significant challenge in the field of eco-design. Indeed, the extension of component lifetime confers substantial environmental benefits, as evidenced by a systemic lifetime cycle approach. Therefore, prediction of the degradation kinetics of components operating at high temperature under the influence of oxidation or corrosion phenomena represents a significant challenge in numerous applications. The modeling and simulation tools that can be used, and

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more specifically developed in this domain, are undergoing constant evolution. Furthermore, the recent surge in the capabilities offered by the development of artificial intelligence-type tools has facilitated the acceleration of data processing and introduces novel perspectives in the design of research projects concerning high temperature corrosion and protection of materials.

This special issue presents a selection of studies in this field, offering new insights on a number of key subjects. These include the influence of grain-boundary diffusion on the depletion profile in chromia-forming alloys undergoing high-temperature oxidation, the prediction of chromia volatilization in water-vapor-rich gas during sample oxidation taking into account gas modification, Pt interdiffusion in bond-coat/superalloy systems, and the automation of cross-sectional metallographic evaluation of slurry coatings using machine learning techniques.

The following papers are contributions from the “Modeling, Prediction and Simulation” session of the 11th International Conference on High-Temperature Corrosion and Protection of Materials (HTCPM 2024), held at Les Embiez Island, France, on 9–14 June 2024.

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