# Special Issue

# Advanced Materials for Solid Oxide Cells: Performance and Degradation Modeling

## Message from the Guest Editors

Solid oxide cells (SOCs), encompassing both fuel cells (SOFCs) and electrolysis cells (SOECs), are key technologies in the transition to sustainable energy systems, offering high efficiency, fuel flexibility, and reversible operation. However, their widespread deployment is hindered by complex performance-limiting mechanisms and long-term degradation under high-temperature operation. Accurate modeling and prediction of SOC performance and degradation are essential to improving their reliability, longevity, and integration into real-world applications. This Special Issue aims to gather cutting-edge research focused on the modeling, simulation, and prediction of SOC behavior. We welcome contributions that use multi-physics and multi-scale modeling approaches to examine degradation mechanisms, predict lifetime prediction, and optimize performance under realistic operating conditions. Topics of interest include: electrochemical modeling of SOC components; thermal and mechanical stress analysis; degradation modeling of electrodes and electrolytes; modeling of redox cycling, poisoning, and thermal aging; and data-driven or machine learning approaches to performance forecasting, etc.

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## Deadline for manuscript submissions

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## Message from the Editorial Board

*Materials* (ISSN 1996-1944) was launched in 2008. The journal covers twenty-five comprehensive topics: biomaterials, energy materials, advanced composites, advanced materials characterization, porous materials, manufacturing processes and systems, advanced nanomaterials and nanotechnology, smart materials, thin films and interfaces, catalytic materials, carbon materials, materials chemistry, materials physics, optics and photonics, corrosion, construction and building materials, materials simulation and design, electronic materials, advanced and functional ceramics and glasses, metals and alloys, soft matter, polymeric materials, quantum materials, mechanics of materials, green materials, general. *Materials* provides a unique opportunity to contribute high quality articles and to take advantage of its large readership.

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