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Advanced Diagnostics and Component Development for High Temperature Energy Systems

Motivation

Corrosion in Molten Salt Reactors (Salt Impurity Measurements)

- Fluoride salts are under consideration for use in molten salt reactors. While fluoride salts have strong thermal properties that make them a promising alternative to traditional reactors that rely on steam, molten salts can be corrosive at high temperatures. Mechanisms to analyze the impurities in fluoride salts can be used in reactors to monitor the health of the components and to detect potential failures before they become an issue. These probes however, have to be able to survive the high temperature, harsh conditions of the molten salts.

Materials Corrosion in Heat Exchangers (Advanced Materials for Heat Exchangers)

- Cermet materials are being researched to provide an alternative to concentrated solar power system heat exchanger materials due to the increased thermal conductivity and potential material strength at operational temperature compared to traditionally alloys.



Objectives

Corrosion in Molten Salt Reactors

- Design a high temperature, salt compatible probe for measuring the electrical conductivity of fluoride salts.
- Measure and determine impurities in fluoride salts based on changes in electrical conductivity using the designed apparatus. This measurement will help monitor the health of the containment materials and other components within the reactor.

Materials Corrosion in High Temperature sCO₂ Heat Exchangers

- Measure and analyze the exposure of cermet Ni alloys in supercritical CO₂ at high temperatures (750C) and high pressure (25 MPa) to provide indication of the materials ability to withstand the demand of high temperature sCO₂ power cycles.