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Unexpected effect of nanoparticles doping on the corrosivity of molten nitrate salt for thermal energy storage

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Highlights

- Effect of nanoparticles-doping on the corrosivity of molten nitrate salt is presented for the first time.
- Unexpected new mechanism of increased corrosivity is revealed.
- Corrosion rates increased 2-3 times when nanoparticles are added to the salt.

Abstract

Molten nitrate salts are currently the most common mature solution for thermal energy storage at the concentrated solar power (CSP) plants. Enhancing heat capacity and thermal conductivity of molten salts via doping by inorganic nanoparticles has attracted an explosively increasing interest due to the possibility of a considerable decrease of the investment costs for CSP technology. However, to the best of our knowledge there is almost no information on the effect of such doping on the corrosivity of the molten salts. In this work we demonstrate that adding small amounts of nanoparticles into the molten nitrate HitecXL salt considerably increases its corrosivity and modifies the corrosion mechanisms. A set of advanced techniques such as SEM-EDX, XPS and XRD are applied to get insights into the effect of inorganic nano-additives on the corrosion phenomenon.

Keywords

Corrosion; Thermal energy storage; Concentrated solar power; Molten salt