



Research Paper

Natural and by-product materials for thermocline-based thermal energy storage system at CSP plant: Compatibility with mineral oil and molten nitrate salt



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HIGHLIGHTS

- Compatibility of natural and by-product materials with different HTFs is presented.
- A degradation mechanisms and compatibility recommendations are provided.
- Magnetite and River rock are compatible with Delcoterm Solar E15 mineral oil.
- None of the tested materials are compatible with the molten HitecXL salt.

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ABSTRACT

The use of thermal energy storage (TES) systems at concentrated solar power (CSP) plants is one of the main ways of increasing the dispatchability and hence the competitiveness among other renewable energies. The thermocline packed bed TES technology is particularly attractive in terms of cost-effectiveness. This is due to the single-tank configuration and the possibility of using low cost filler materials as TES working body. One of the main concerns for packed bed TES systems is the thermal and chemical stability of a filler material in direct contact with the heat transfer fluid. With these regards, the compatibility of previously evaluated filler materials with paraffinic mineral oil and with molten HitecXL salt heat transfer fluids is reported in this work. The most promising material will be selected for its implementation in the packed bed TES unit deployed at the 1 MW_{el} pilot CSP plant and its 1/100 scale prototype constructed in the framework of the H2020 ORC-Plus project.

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