

## Natural Magnetite for thermal energy storage: Excellent thermophysical properties, reversible latent heat transition and controlled thermal conductivity

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### Highlights

- Low price, available, ecological friendly and non-flammable material with excellent thermophysical properties is proposed.
- An industrially appropriate treatment route developed to program thermal conductivity in a wide range of values.
- Thermal capacity is extended by the latent heat of reversible antiferromagnetic transition.

### Abstract

Thermal energy storage (TES) has gained growing interest in the area of renewable energy due to its great potential for increasing the efficiency of concentrated solar power (CSP) plants. One of the central issues is the development of a working body with desirable properties, namely, thermal conductivity; heat capacity; density; price; availability; and eco-friendliness. This study reports the thermophysical characterization and proposes a reliable and industrial appropriate treatment route for natural Magnetite to obtain a material possessing not only a combination of the above properties, but also the possibility of easy control (programming) of thermal conductivity in a wide range of values. The combination of such properties is exceptional and crucially advantageous for TES applications like packed-bed heat storage systems.

### Keywords

Concentrated solar power; Thermal energy storage; Thermocline storage system