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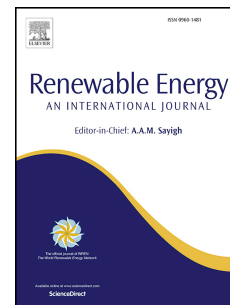
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1 Thermal-physical properties of nanoparticle-seeded nitrate molten salts

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8 Abstract

9 Molten salts have been used extensively as energy storing materials, however, their
10 thermophysical properties, such as specific heat capacity and thermal conductivity
11 have limited their applications. In this study, potassium nitrate and sodium–
12 potassium nitrate (NaNO₃:KNO₃ with 60:40 molar ratio) are used as the base salts
13 with different types of nanoparticles, which are iron oxide (Fe₂O₃), titanium dioxide
14 (TiO₂) and copper oxide (CuO) over a wide range of temperatures up to 773 K. Laser
15 flash analysis is used to measure thermal diffusivity and dynamic scanning
16 calorimeter for specific heat (latent heat and melting temperature) of the molten salts
17 and nanosalts. The addition of Fe₂O₃ into sodium–potassium nitrate salt increases
18 thermal diffusivity up to 50%. Moreover, the highest increase in the latent heat
19 reaches 14.45% at 1 wt. % CuO-binary nitrate salt. In addition, the total thermal
20 energy storage of nanosalt increases up to 6% including both of sensible and latent
21 heat. The formation of the interface layer between nanoparticles and salts could be
22 the reason behind this enhancement in sensible and latent heats. The morphology of
23 nanosalt measured by scanning electron microscopy showed a heterogeneous
24 dispersion of nanoparticles, including agglomerated areas that could be sometimes
25 responsible for the degradation of the performance.

26
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28 **Keywords:** nanofluid, nitrate salt, specific heat capacity, latent heat, thermal energy
29 storage, thermal diffusivity.

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