

## **Influence of Surfactant on Supercooling Degree of Aqueous Titania Nanofluids in Energy Storage Systems**

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**Abstract :** Considering the demand to reduce global warming potential and importance of solidification in various applications, there is an increasing interest in energy storage systems to find the efficient phase change materials. Therefore, this paper presents an experimental study and comparison on the potential of titania nanofluids with and without surfactant for cooling energy storage systems. A designed cooling generation device based on compression refrigeration cycle is used to explore nanofluids solidification characteristics. In this work, titania nanoparticles of 0.01, 0.02 and 0.04 wt.% are dispersed in deionized water as base fluid. Measurement of phase change parameters of nanofluids illustrates that the addition of polyvinylpyrrolidone (PVP) as surfactant to titania nanofluids advances the onset nucleation time and leads to lower solidification time. Also, the experimental results show that only adding 0.02 wt.% titania nanoparticles, especially in the case of nanofluids with a surfactant, can evidently reduce the supercooling degree by nearly 70%. Hence, it is concluded that there is a great energy saving potential in the energy storage systems using titania nanofluid with PVP.

**Keywords :** cooling energy storage, nanofluid, PVP, solidification, titania

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