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【摘要】

本研究使用以真空潛弧製造系統製備之氧化銅奈米流體為實驗樣本，首先分析其熱性質，做為應用研究基礎，探討其熱傳導係數與黏滯係數進行實驗分析。並將奈米流體實際應用於儲冷冰球，觀察其結冰與釋冷之狀況，評估應用。由研究結果發現：在奈米流體體積濃度影響方面，樣本溫度40℃時，0.2 %vol能提升熱傳導係數5.1%，當體積濃度0.2 %vol能提升黏滯係數增加4%，當體積濃度上升到0.8 %vol時，則能上升到14%，體積濃度對於熱傳導係數及黏滯方面，體積濃度0.8 %vol時，樣本5℃時能提升熱傳導係數2.5%，當溫度上升到40℃時，則能上升到23%，同樣上升到40℃時，則能上升到14%。濃度與溫度對於熱傳導係數的影響均大於對黏滯度的影響。在儲能冰球應用研究方面，高則改善的效果越明顯，在冷卻溫度-6℃時，約能減低0.5℃的過冷度，在冷卻溫度到達-15℃時，過冷卻溫度的粒徑等方面進行相關的研究，以期將奈米流體的相關應用能更貼近實務面。

【英文摘要】

In this study, the sample of CuO nanofluids are prepared by the submerged arc nanoparticle synthesis system (which can be the research bases, and then it is experimented that the variation of the thermal conductivity and viscosity for different temperatures. Finally, these nanofluids are used in the ice capsules, and the practicability of being applied in surveying the freezing and melting condition. From the experimental results, it is found as follows. At 40℃, for the effect of the volume fraction, the fluids of 0.2 and 0.8 %vol elevate thermal conductivity 22%. Besides, at the same condition, the fluids of 0.2 %vol elevate viscosity increment of the thermal conductivity and viscosity is about proportional to the volume fraction. At 0.8 %vol, for the effect of the temperature, the fluids elevate thermal conductivity 2.5%, and those at 40℃ elevate thermal conductivity 23%. Besides, at the same condition, at 40℃ elevate viscosity 14%. The effects of the volume fraction and temperature on the thermal conductivity and viscosity in ice capsules, it is found that adding nanoparticles can improve the supercooling problem and more for higher concentration, the supercooling degree is reduced 0.5℃, but at -15℃ of cooling temperature, the supercooling degree is reduced 15%. Different materials and different particle sizes to make nanofluids more practicable.

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