

## **Phase Change Characteristics of Emulsion Including Nanoparticle as a Latent Heat Storage Material**

Koji Fumoto<sup>C, S</sup>

*Hirosaki University, Department of Intelligent Machines and System Engineering, Hirosaki, Aomori, Japan  
kfumoto@cc.hirosaki-u.ac.jp*

Masahiro Kawaji

*City College of NewYork, Department of Mechanical Engineering, NewYork, NY, U.S.A.*

Tsuyoshi Kawanami

*Kobe University, Department of Mechanical Engineering, Kobe, Hyogo, Japan*

Recently, a great deal of attention has been paid to energy saving devices in place of conventional air-cooled and water-cooled devices. The thermal energy storage system that uses the latent heat of a phase-change material (PCM) for air-conditioning or heating has recently become popular because it does not require high electric power and it saves energy. Therefore, functional thermal storage materials including PCMs are already being used for a wide variety of practical purposes. Especially, a phase change emulsion (PCE) has been studied for its potential use as a functional fluid in thermal storage systems because of its high-energy storage capacity and transportability.

The primary objective of the present study is to experimentally investigate the fundamental phase change characteristics of the nanoemulsion using differential scanning calorimetry (DSC). Tetradecane and octadecane are utilized as the phase change material for the nanoemulsion. Both of these materials, which are types of n-alkanes, have the following characteristics. Tetradecane has a slightly higher melting point compared with water, and octadecane has a melting point around room temperature. The melting point of tetradecane and octadecane, melting peak temperature of their mixtures, and latent heat has been discussed in detail. As a result, it was found that the nanoemulsion containing tetradecane and octadecane have two melting peak temperatures. In terms of the fundamental melting characteristics of the mixtures, it was confirmed that the phase change behavior with repeated solidification and melting process does not change.