

TA1036 - Thermal behavior of paraffin wax by sample observation DSC

Introduction

Phase change material or PCM is a material that can absorb, store and release large amounts of latent heat within a specific temperature range during phase transition reaction. Several materials have been identified as a latent heat storage medium and are classified as organic PCMs, eutectics, inorganic PCMs and clathrate hydrate. Paraffin is an alkane organic PCM, effective for latent heat storage medium via their melting transition and is recently studied in different applications such as solar thermal storage, air-conditioning buildings, integration with fabrics intended for special environmental conditions and others. In this application, sample observation DSC was performed to evaluate the thermal behavior of paraffin wax.

Measurement and results

Commercially available paraffin wax weighing 3 mg placed in an aluminum crucible was measured in a DSCvesta equipped with sample observation option heating and cooling from 0°C up to 80°C at 5°C/min. DSC results with snapshots of actual sample images in arbitrarily selected temperatures are shown in the figure below. DSC results revealed two endothermic peaks were observed at 43°C and at 60°C due to solid-solid phase transition and solid-liquid transition (melting), respectively. The actual sample image showed no changes in shape, color or volume in the solid-solid phase transition. On the other hand, the sample images revealed the loss of the sample's solidity in the solid-liquid transition (melting). These phenomena are confirmed in the second run after the cooling process. During the cooling process, we can observe exothermic peaks due to crystallization (liquid-solid transition) and solid-solid phase transition in which crystallization was confirmed from the sample images. These crystallization and melting cycles are the unique features of PCMs which were successfully observed using the sample observation DSC.

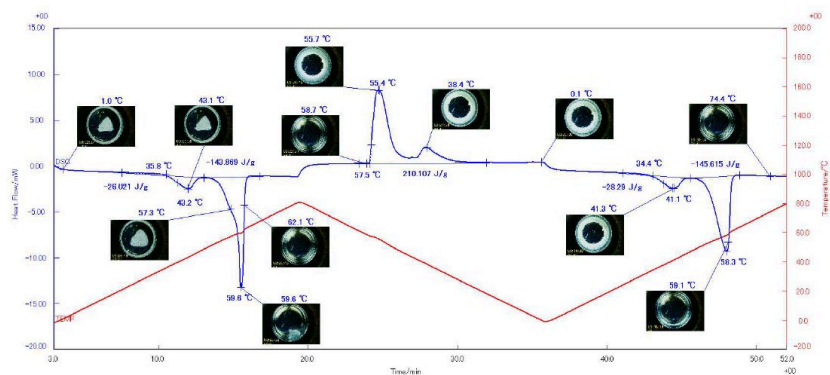


Figure 1: Thermal behavior of paraffin wax by sample observation DSCvesta

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DSCvesta

DSC is a thermal analysis technique that quantifies the amount of energy in a reaction.