

ABSTRACT

PCM (Phase Change Material) is a type of Thermal Energy Storage (TES) material in the latent heat category. PCM stores and releases energy by means of a phase change. This research uses organic PCM material based on corn oil and water with the addition of carbon nano coconut shell charcoal. Coconut shell carbon nanochar is produced using shaker mills for approximately 2,000,000 cycles. This PCM material is composed of a mixture of corn oil and water with corn oil concentrations of 35% and 40%. Furthermore, the PCM material was added with nano carbon particles with concentrations of 50,100 and 150 ppm. The first test was carried out by testing the specific heat and testing FTIR (Fourier Transform Infrared). Specific heat testing is carried out first to determine the specific heat value of a mixture of corn oil and water. While the FTIR test was carried out to determine the presence of a molecular group of PCM material. The results showed that the specific heat of PCM material decreased along with the increase in the addition of carbon nano. When compared with the results of materials without carbon nano, the addition of 50 ppm carbon nano can reduce the specific heat by 11%. The highest decrease occurred in PCM material with 20% corn oil concentration and the addition of 150 ppm carbon nano, which was 62.41%. FTIR spectrum analysis showed the presence of an amine molecular group (C = C). The presence of an amine group can increase the heat carbon content of the PCM material.

Keywords: Organic PCM, Corn oil solution, specific heat, FTIR

INTISARI

PCM (*Phase Change Material*) adalah salah satu jenis material *Thermal Energi Storage (TES)* dalam kategori panas laten. PCM menyimpan dan melepas energi dengan cara perubahan fase. Penelitian ini menggunakan material PCM organik berbahan dasar minyak jagung dan air dengan penambahan karbon arang tempurung kelapa. Karbon arang tempurung kelapa yang berukuran nano diproduksi dengan menggunakan mesin *shaker mills* selama kurang lebih 2.000.000 siklus. Konsentrasi bahan PCM adalah 35% dan 40% (v/v) minyak jagung dalam pelarut air. Selanjutnya bahan PCM tersebut ditambahkan partikel karbon nano dengan konsentrasi 50, 100 dan 150 ppm. Pengujian pertama kali dilakukan dengan menguji kalor jenis dan pengujian FTIR (*Fourier Transform Infrared*). Pengujian kalor jenis dilakukan terlebih dahulu untuk mengetahui nilai kalor jenis dari campuran minyak jagung dan air. Sedangkan pengujian FTIR dilakukan untuk mengetahui adanya gugus molekul material PCM. Hasil penelitian menunjukkan bahwa kalor jenis material PCM menurun seiring dengan peningkatan penambahan karbon nano. Bila dibandingkan dengan hasil material tanpa karbon nano, penambahan 50 ppm karbon nano mampu menurunkan kalor jenis sebesar 11%. Penurunan tertinggi terjadi pada material PCM dengan konsentrasi minyak jagung 40% dan penambahan 150 ppm karbon nano yaitu sebesar 62,41%. Analisis spektrum FTIR menunjukkan adanya gugus molekul amina ($C = C$). Adanya gugus amina dapat meningkatkan kadar karbon kalor jenis material PCM.

Kata Kunci: PCM Organik, Larutan minyak jagung, Kalor jenis, FTIR