Supporting Information

Shape-Stable Epoxy-PCM Coated Nylon Fabrics for Wearable Thermal Management

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Materials

Hexamethylenetetramine, lauric acid (LA), and myristic acid (MA) were procured from Sigma-Aldrich and utilized as received. The epoxy-terminated dimethylsiloxane (ETDS) oligomer, designated as KF-105 (EP) and characterized by an equivalent weight of 490 g/eq and a density of 0.99 g/cm³, was obtained from Shin-Etsu Chemical Co., Ltd. The nylon fiber (NF) fabric was obtained from RTBIO (Bucheon, Korea)

Characterization

The changes in chemical structure induced by the surface treatment were analyzed using Fourier transform infrared spectroscopy (FT-IR, attenuated total reflectance mode, Perkin-Elmer Spectrum One) and X-ray photoelectron spectroscopy (XPS, VGMicrotech system). The morphology of composites was observed using a field-emission scanning electron microscope (FE-SEM, SIGMA 300, Carl Zeiss).

The thermal diffusivity (α, mm²/s) and specific heat capacity (C_p, J/g·K) were measured using a laser flash analyzer (LFA, LFA 1000, Linseis Messgeraete GmbH) and a differential scanning calorimeter (DSC, DSC-7, Perkin-Elmer Co.), respectively. The thermal conductivity (K, W/m·K) was subsequently calculated using the formula: $K = \alpha \times C_p \times \rho$, where ρ (g/cm³) denotes the bulk density of the composite materials.

The mechanical properties of the composites were evaluated on a universal testing machine (UTM, model 3344Q9465, Instron Co.) following the ASTM D 638 standard, with a crosshead speed of 2 mm/min. The volume resistivity of the composites were evaluated using the four-point probe method (2400 Source Meter, Keithley). Composite thicknesses were measured using a digital micrometer to ensure precise characterization of electrical properties.