Anisotropic thermal conductivity of three-layer laminated carbon-graphite composites from carbonized wood

Abstract

Composites with characteristics of anisotropic thermal conductivity for thermal management in Solar Power Satellite (SPS), to discharge the heat that was generated when solar energy was not converted to electricity, were developed by alternating layers of laminated graphite and carbonized wood. The effects of the weight fraction of carbonized wood, particle size, interlayer interfaces, and environment temperature on the thermal conductivity and the ratio of thermal conductivity between horizontal and vertical directions (H/V ratio) to the plain surface of samples were discussed. The thermal conductivities of carbon–graphite (C/G) composites were measured using the laser flash method. Laminated C/G composites improved the anisotropic thermal conductivity. The highest H/V ratio of 10.17 was obtained at 10 wt% of carbonized wood. Particle size and interlayer interfaces were found to affect the anisotropic thermal conductivity. The thermal conductivity of C/G composites increased with increasing temperature from 25 °C to 150 °C.