Emissivity Measurements of Carbon Nanotubes at High Temperatures

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Emissivity of a forest of vertically aligned multi-walled carbon nanotubes at high temperatures has been measured by pulse heating calorimetry or by comparing between the normal spectral radiations from the sample and blackbody cavity at the same temperature. The carbon nanotube samples were grown on isotropic graphite or glass-like carbon strips by a chemical vapor deposition process where acetylene gas was used as the law material of the carbon nanotubes. The length of carbon nanotube samples ranges beyond 100 mm. The hemispherical total emissivity of the carbon nanotube forest was measured based on the calorimetric method. The normal spectral emissivity of the carbon nanotubes in the infrared wavelength region was measured by the blackbody comparison method using FTIRs. To measure the high temperature emissivity, the carbon nanotube forest grown on the carbon strip was rapidly heated by the passage of large current through the strip itself. The temperature of the carbon nanotubes heated at high temperatures was measured by a type C thermocouple whose two wires are in contact with the side edges of the carbon strip, respectively. The results demonstrate that the carbon nanotube forest grown on a carbon strip is a useful alternative of blackbody furnaces at temperatures beyond 1500 K.