Assessment of BAM Phosphors for Particle Temperature Measurement in Multiphase Flow

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ABSTRACT

The temperature measurement of phosphors, heated by high radiation flux, has been investigated. Laser induced phosphorescence (LIP) has been applied to yield non-intrusive surface temperature of moving particles in multiphase flow. LIP can provide more accurate measurement than other techniques due to its less sensitivity to the interference from the background. The radiation was supplied by a solid state solar thermal simulator (SSSTS), recently developed at the university of Adelaide, supplying ~ 30,000 suns, with near top-hat profile. In this work, BAM phosphors were suspended in the fluidized bed by air with constant gas flow rate to ensure the stability of particle fluidization. Single shot and averaged particles temperatures were recorded and compared at several fluxes up to around 30 MW/m^2. For each radiation flux, LIP images were recorded at two spectral area and then separated and retrieved by two spectral bandpass filters using the image splitter system and ICCD camera. The pair of the spectrally resolved images yielded two-dimensional particle temperatures. The average particle temperature could reach up to around 450 °C with the highest heating flux.