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Journal of Visualized Experiments

Submission of manuscript titled "Enhanced Spectral Emissivity of Single and Coated SiC Micro/Nano-Spheres" by Yi Zheng, Nicholas Bonatt, and Laura Lin

Dear Editor,

Please find enclosed the above referenced manuscript submitted for possible publication in the Journal of Visualized Experiments. We use fluctuational electrodynamics to determine spectral emissivity for spherical shapes, such as a single sphere and a coated sphere, in a homogeneous and isotropic medium. The dyadic Green's function formalism of radiative energy for different spherical configurations has been developed. We have shown, that emission spectra of micro- and nano-sized single and coated spheres display several emissivity sharp peaks as the size of object reduces to a nanoscopic length scale. This theoretical work has to be verified by physical fabrication of SiC micro/nano-spheres and experimental measurement of their spectral emissivity

FTIR spectroscopy has been used for different studies of high-temperature spectral emissivity measurements. The biggest advantage is that the whole spectrum is detected simultaneously. The experimental setup described in the manuscript for the measurement of the spectral emissivity is simple and an economic solution. FTIR spectroscopy gives a more detailed characterization and deeper understanding of material properties. As no one conducted the experimental measurement of the emissivity spectrum of nano-spheres before, the mounting of the nano-sphere on a thin pin of non-radiating material is just an idea. Therefore, the practical feasibility of this structure has to be validated.

The study of electromagnetic fluctuation-induced radiative energy for spherical shapes has great applications in the nanoscale engineering, e.g. nano-beads, nanoparticle-nanofiber composites, and multilayer-coated spherical shells. It deserves further theoretical and experimental investigation on the study of enhanced wavelength selectivity of radiative thermal properties of nano-sized particles.

This work is funded by the Start-up Grant through the College of Engineering at the University of Rhode Island.

Thank you for your attention.

Best regards,

Yi Zheng, Ph.D.