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Spectral Tuning Of Solar Irradiation with Water-Based Nanofluid for Energy Collection and Natural Illumination

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Abstract

In recent decade nanofluids have been intensively investigated for enhancing solar energy collection. We recently proposed a new idea and louver device for simultaneous solar energy harvesting and daylighting. Water is nearly transparent to visible (VIS) light but highly absorbing of ultraviolet (UV) and infrared (IR). Thus, water-based nanofluids could be employed to spectrally tune the solar irradiation to realize the dual-purpose: illumination and energy harvesting. In this talk, we will investigate the spectral absorption and scattering efficiencies of some nanoparticles (NPs) commonly used in solar energy research as well as the enhanced heat transfer with use of nanofluid. The effects of NP size and concentration are scrutinized. Results show that a louver filled with dilute 0.00004 vol% Ni-water nanofluid with particle diameter of 80 nm under AM1.5 model can transmit 46.5% solar VIS for daylighting and harvest 65.7% of the total solar energy.