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ABSTRACT

Flat plate solar air heaters (SAHs) are widely used in many solar thermal applications, to enhance its capability to harvest solar radiation, the solar selective coating should be used. Consequently, a novel solar selective coating with high solar absorptance(α) and low emittance(ε) is fabricated by embedding carbon nanotubes (CNTs) and cupric oxide nanoparticle (CuO) into the black paint. By using UV-Vis and FTIR spectroscopies, the optical properties of several percentages of the CNTs and CuO nanoparticles are studied. Besides, X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM) are used to study the chemical composition and surface morphology, respectively. The results showed that 4% CNTs/CuO-black paint is the highest solar selective coating with solar absorptance and thermal emittance reaches 0.964 and 0.124, respectively. Energy and Exergy performances of SAH coated with the new selective coating are investigated under four airflow rates. The obtained results show that energy efficiency enhanced by approximately 24.4%. The difference between outlet and inlet temperatures of the air across SAH raises to 22% based on averaged values. SAH with new coating shows higher exergy efficiency.