Experimental study of nanofluids flow and heat transfer over a backward-facing step channel

ABSTRACT

The forced convective heat transfer and friction factor of nanofluids flow over a backward-facing step (BFS) in a channel with the base wall dissipating a uniform heat flux are experimentally investigated in this paper. Nanoparticles such as CuO and MgO dispersed in pure ethylene glycol (EG) with average diameters of 40 nm, and volume concentrations of 0, 1, 3, and 5% are considered as the working nanofluids. The results indicate that the heat transfer rate increases as the volume concentration of nanoparticles increased. The Nusselt number is enhanced up to 11% at 0.05 volume concentration compared to pure EG. The friction factor increases up to approximately 15% at Reynolds number (Re) of 5000 and volume concentrations of 0.01 and 0.03. The maximum value of the PEC in a BFS channel is 1.5 for the CuO-EG and 1.2 for the MgO-EG at a volume concentrations of 0.03 and Re = 20,000.

Keyword: CuO nanoparticles; Forced convection; Backward-facing step; Experimental Nusselt number