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ABSTRACT

Proton Exchange Membrane Fuel Cell (PEMFC) is an alternative energy applications for vehicular power sources and is a strong contender for a clean and efficient power generation. However, the heat generated by the PEM fuel cell need to be taken care efficiently in order to avoid damage to fuel cell component especially membrane due to overheat. Excessive heat can also lead to performance deterioration of PEMFC. Therefore, nanofluids adoption as cooling medium is studied for PEMFC. In this study, the heat transfer performance of Aluminium Oxide (Al_2O_3) and Silicon Dioxide (SiO_2) in serpentine and distributor cooling plate with different value of low concentration of 0.1%, 0.3% and 0.5% volume is numerical analyzed. The nanofluids with different concentration was dispersed in water and water: ethylene glycol (W: EG) of 60:40 and 50:50 mixture with base fluids. The nanofluids is adopted as cooling medium in a serpentine and distributor cooling plate of PEMFC which are subjected to a constant heat flux of 300W to replicate heat released from bipolar plate of PEMFC. The simulation used was ANSYS Fluent in laminar flow condition. The result shows that there is maximum of 2.04 % improvement in Al_2O_3 while 0.9 % improvement in SiO_2 in heat transfer coefficient of 0.5% volume concentration as compared to water in serpentine plate is recorded. It is also observed that serpentine does give better heat transfer enhancement as compared to distributor plate. However, the improvement also accompanied by pressure drop increment of 68% in Al_2O_3 and 189% SiO_2 nanofluids as compared to base fluid water.

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