Water:Ethylene Glycol Properties Alteration Upon Dispersion Of Al_2O_3 and SiO_2 Nanoparticles

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ABSTRACT

Proton exchange membrane fuel cell (PEMFC) seems to be a popular option as a green energy carrier due to its high efficiency and pollutant-free operation. However, the slight temperature difference between the working temperature and surroundings requires innovation in cooling strategy. Active thermal management strategy is limited due to the larger space requirement. Alternatively, utilizing nanofluids as coolant as the passive cooling strategy tends to be a viable quick fix. In this research, thermophysical properties of Al_2O_3:SiO_2 hybrid nanofluids in the base fluid of water: Ethylene Glycol (EG) were discussed comprehensively concerning alterations made in thermal conductivity, dynamic viscosity, and electrical conductivity properties. There were four mixture ratios of 0.5% volume concentration of hybrid nanofluids considered ranging from 10:90, 30:70, 50:50, and 70:30 Al_2O_3:SiO_2. Upon completion of the study, there is an improvement of 9.8% shown in 10:90 Al_2O_3:SiO_2 hybrid nanofluids for thermal conductivity measured at 60℃ in comparison to the base fluid. Meanwhile, 10:90 Al_2O_3:SiO_2 hybrid nanofluids are also favorable with the lowest values of viscosity as compared to other mixture ratios resulting in lower parasitic loss. Electrical conductivity on the other hand also showed an increment in 10:90 Al_2O_3:SiO_2 hybrid nanofluids as compared to base fluid and other mixture ratios.

Keywords: *Dynamic Viscosity; Electrical Conductivity; Thermal Conductivity; Aluminium Oxide; Silicon Dioxide*

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