

Ibtisam A. Hasan

Electro mechanical Engineering
Department, University of
Technology, Baghdad., Iraq.
dr_ibtisam_ahmed@yahoo.com

Khaliid F. Sultan

Electro mechanical Engineering
Department, University of
Technology, Baghdad., Iraq.
ksultan61@yahoo.com

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Performance Evaluation of the V–basin Tube Solar Collector by Using Different Nanoparticles and Base Fluids

Abstract- This research discuss the performance and evaluation of V – basin collector in heating systems of solar with different nanofluids and base fluids, where metal nanofluids [Ag (20nm) + DW + EG], and metal oxide nanofluid [TiO₂ (40nm) + DW + EG] are the used operating fluids with flow rate of 25 lit/hr, 50 lit/hr and ratios of concentration (i.e. 1, 2, 3 and 5 % vol). The base fluids employed in these experiment is distilled water and ethylene glycol. The metal and oxide metal nanofluids are shown a significant improvement in the performance of V –basin tube solar collector with higher thermal conductivity as well as heat transfer comparing to the base fluid (distilled water and ethylene glycol). The metal nanofluids [Ag (20nm) + DW + EG] at 5 % vol and flow rate of 25, and 50 lit/hr showed an important impact in characteristics values of thermal solar for $f_R(\tau\alpha)$, $-f_R U_L$ were $-6.317 \text{ W/m}^2 \cdot ^\circ\text{K}$, 0.522 and $-6.524 \text{ W/m}^2 \cdot ^\circ\text{K}$, 0.542 , whereas for the oxide nanofluid (TiO₂ (40nm) + DW+EG) were $-5.523 \text{ W/m}^2 \cdot ^\circ\text{K}$, 0.473 and $-5.1731 \text{ W/m}^2 \cdot ^\circ\text{K}$, 0.502 severally. The characteristics values of thermal solar to Dw and EG for flow rate of 25 lit/hr and 50 lit/hr were $-4.033 \text{ W/m}^2 \cdot ^\circ\text{K}$, 0.382 , $-4.065 \text{ W/m}^2 \cdot ^\circ\text{K}$, and 0.421 severally. The size and type of nanofluid are necessary to enhancement heat transfer process, and improve performance of solar collector of V-basin type. The metal and oxide nanofluids used as a working fluid may improve the thermal performance of tube solar collector of V – basin because of small nanoparticles for metal, oxide metal and high thermal conductivity of silver. The metal and oxide nanofluids achieved an improvement when it was compared to DW and EG mostly at a high Inlet temperature. The impacts of metal nanofluid and oxide metal nanofluids are taken into regard on solar nanofluids system of heating as well as different base fluids.

Keywords- metal nanofluid, V–basin tube, oxide nanofluid, ethylene glycol

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