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Application of Response Surface Methodology to Optimize the Thermal Conductivity Enhancement of a Hybrid Nanofluid

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Abstract : In this experimental work, unlike conventional methods that mix two nanoparticles together, silver nanoparticles have been synthesized on the surface of graphene. In this research, the effect of adding modified graphene nanocomposite-silver nanoparticles to the base fluid (distilled water) was studied. Different transmission electron microscopy (TEM) and field emission scanning electron microscope (FESEM) techniques have been used to examine the surfaces and atomic structure of nanoparticles. An ultrasonic device has been used to disperse the nanocomposite in distilled water. Also, the thermal conductivity coefficient was measured by the transient hot wire method using the KD2-pro device. In addition, the thermal conductivity coefficient was measured in the temperature range of 30°C to 50°C, concentration of 10 ppm to 1000 ppm, and ultrasonic time of 2 minutes to 15 minutes. The results showed that with the increase of all three parameters of temperature, concentration and ultrasonic time, the percentage of increase in thermal conductivity will go up until reaching the optimal point, and after passing the optimal point, the percentage of increase in thermal conductivity will have a downward trend. To calculate the thermal conductivity of this nanofluid, a very accurate experimental equation has been obtained using Design Expert software.

Keywords : thermal conductivity, nanofluids, enhancement, silver nano particle, optimal point
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