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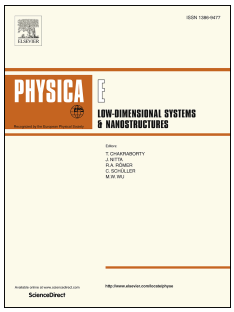

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ACCEPTED MANUSCRIPT

Optimization of thermophysical properties of Al_2O_3/water-EG (80:20) nanofluids by NSGA-II

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Abstract

In this study, two-objective optimization is applied to reduce the viscosity and increase the thermal conductivity of Al_2O_3-water/EG (20-80) nanofluids. For this purpose, experimental data were used for thermal conductivity and viscosity of Al2O3/water-EG nanofluid. The modified Non-dominated Sorting Genetic Algorithm (NSGA-II) has been used to optimize both objective functions of viscosity and thermal conductivity of nano-fluids via design variables of temperature and volume fraction. To approximate objective functions by means of experimental data, the MLP (Multi-Layer Perceptron) neural network modeling is separately executed in each objective function. To achieve the design optimal points, the neural network modeling has been connected to the optimization algorithm and summoned at any evaluation of the fitness function. The body of optimal points is finally presented as the Pareto Front. According to results, maximum temperature is the best recognized point to optimize viscosity and thermal conductivity simultaneously.

Keywords: Nanofluid; NSGA-II; ANN; Thermal conductivity; Viscosity

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