Algorithm of pores distribution model for analysis and measurement of thermal conductivity of polypropylene porous material

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Abstrak

In the current study, algorithm pore distribution models of porous material are developed for insulator application through establishing the effects of pore shape, content and size, which acts as an expression of the nature of porous material. The arrangement of pore distribution in the polypropylene (PP) system is determined by various irregular shape studies. The model is simulated through representative volume elements (RVEs) with the pore content, which is set in the range of 5-24 vol.%, while the pore sizes are used around 0.2, 2 and 3 mm of diameter size. A significant improvement in the optimization of the insulator model is showed by synergistic effect on decreasing thermal conductivity in increasing the content of the pores. The results obtained show that the various irregular shapes of porous material produce various final results in thermal conductivity. The thermal conductivity of the porous material that contained 24 vol.% of pores significantly improved from 0.22 W/m.K to 0.158 W/m.K. Comparison of the simulation showed that the data matched well with the Maxwell-Eucken and Hashin–Shtrikman bounds models.