

Enhancement of Thermal Conductivity in Transformer Oil Containing Alumina Nanoparticles

송현우*, 최 철, 최경식, 오제명
한전 전력연구원
(hwsong@kepri.re.kr*)

The alumina dispersed transformer oils which containing nano-sized particles were prepared by surface modification. The gas-phase synthetic alumina nanopowders with diameters from μm to nm were bead-milled then treated with stabilizing agents. The transformer oil containing surface-modified alumina nanoparticles was prepared. The characteristics of modified nanoparticles, surface properties and size distributions, were examined by FTIR spectroscopy, PSA and TEM. The FTIR results revealed that hydrophobicity of nanoparticles was caused by chemical reaction between hydroxyl groups of particle surface and functional groups of surfactant. Size distributions of nanoparticles were dependant on milling times. The different concentrations of nanofluids were prepared to investigate the dispersion stability and improvement of thermal conductivity. The dispersion stability of hydrophobic nanoparticles was dependant on surfactants and its amounts and was excellent in transformer oil. The thermal conductivity of alumina-transformer oil compared with a pure transformer oil was measured by transient hot-wire method.