MAGNETIC ANISOTROPY OF ELECTRIC CONDUCTIVITY IN TRANSFORMER OIL BASED MAGNETIC FLUIDS

M. Molcan[a], P. Kopcansky[a], K. Marton[b], L. Tomco[c], S. Molokac[d], M. Timko[a]

[a]Institute of Experimental Physics, SAS, Watsonova 47, 040 01 Kosice, Slovakia
[b]Faculty of Electrical Engineering and Informatics Technical University in Kosice, 042 00 Kosice, Slovakia
[c]Faculty of Areonautic, Technical University in Kosice, 041 21 Kosice, Slovakia
[d]Faculty of Mining, Ecology, Process Control and Geotechnology, TU Kosice, Letna 9, 042 00 Kosice, Slovakia

9.7 cm

It is well known that as a consequence of dipole - dipole interaction between magnetic particles in magnetic fluids, magnetic particles tend to attract the neighboring particles in the direction of the magnetic moment. It is expected, therefore, that the magnetic particles will form chains and chain like elongated clusters in which the particles are connected magnetically. Such structural configurations of particles result in many physical properties of magnetic fluids i.e. magnetomechanical effects, magnetooptical effects, magneto-dielectric behavior and so on. Four samples of the transformer oil (UTR40) based magnetic fluids with particles of ferrite type $FeO.Fe_2O_3$ prepared by coprecipitation method were studied. The specific conductivity of the prepared samples of different volume concentration of magnetite nanoparticles (MF1 – 0.0162, MF2 – 0.0215, MF3 – 0.0299 and MF4 – 0.03) at different orientations of electric and magnetic field was measured. Electric dipole moments are induced in electric field. The increasing of electric field increases electric dipoledipole interaction between particles and supports their agglomeration. The used volume concentration of magnete nanoparticles is sufficient to cause their aggregation. The decrease of permittivity and electrical conductivity for perpendicular and increase for longitudal mutual orientation of magnetic and electric fields was observed. This effect is known as the magnetodielectric effect. The character of this effect was similar for all concentrations.

13.4 cm

Subject category :

5. Nano-structure, Surfaces, and Interfaces

Presentation mode :

poster

Corresponding author :

M. Molcan

Address for correspondence :

Institute of Experimental Physics, SAS, Watsonova 47, 040 01 Kosice, Slovakia

Email address :

molcan@saske.sk