

# Electrical conductivity of ethylene glycol based nanofluids with various types thulium oxide nanoparticles

JACEK FAL<sup>1</sup>, AGATA SIDOROWICZ<sup>2</sup>, AND GAWEL ŻYŁA<sup>1</sup>

<sup>1</sup>*Department of Physics, Rzeszów University of Technology, Rzeszów, Poland*  
jacekfal@prz.edu.pl

<sup>2</sup>*Institute of Electronic Materials Technology, Warsaw, Poland*

## ABSTRACT

Nanofluids as a new group of nanomaterials are very popular among researchers. Their unique physical properties may find lots of potential application in industry [1, 2]. Transport properties, especially rheology, and thermal conductivity are the most commonly studied properties of these kind of materials. Electrical conductivity is outside the mainstream of research, so it is interesting to work on issue from the standpoint of experimental physics.

The paper presents experimental investigation on electrical conductivity of thulium oxides – ethylene glycol (Tm<sub>2</sub>O<sub>3</sub>–EG) nanofluids based on nanoparticles with three different sizes, and prepared in different conditions. Nanofluids were prepared with two-step method with use of the nanopartocles obtained by precipitation method.

The measurements were conducted at constant temperature 293.15 K for various mass concentrations form 0% to 20% with 5% step. The electrical conductivity was measured using conductivity meter MlutiLine 3410 (WTW GmBH, Weilheim, Germany) and temperature was stabilized in a water bath MLL 547 (AJL Electronic, Cracow, Poland).

The results indicate that increase in mass concentration of nanoparticles in base fluid cause increase in electrical conductivity of Tm<sub>2</sub>O<sub>3</sub>–EG nanofluids. The enhancement in electrical conductivity of nanosuspensions of thulium oxide is dependent on particle size.

## References

- [1] Devendiran D. K., Amirtham V. A. *A review on preparation, characterization, properties and applications of nanofluids*, Renewable and Sustainable Energy Reviews, pp. 21–40, 60.
- [2] Leong K. Y., Ong H. C., Amer N. H., Norazrina M. J., Risby M. S., Ahmad K. Z. Ku *An overview on current application of nanofluids in solar thermal collector and its challenges* Renewable and Sustainable Energy Reviews, pp. 1092–1105, 53.