Uncertainties in the Measurement of Thermal Conductivity of Nanofluids using the Nanoflash Method

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Objective
The purpose of this research is to successfully create a stable nanofluid and measure its thermal conductivity. The uncertainties in the thermal conductivity measurements are investigated and different sources of error are identified. These properties will then be compared to those of the base fluid.

Experimental
Nanofluids are made using different kinds of nanoparticles and mixing them using sonication into various base fluids at certain weight percentages.

Results and Discussions

Sources of Error:
- Sample Preparation
- Graphite Coating
- Teflon Coating
- Shelf Life of Base Fluid
- Liquid Behavior vs. Solids

Discussion
The measured thermal conductivity was consistently much higher than the thermal conductivity of the base fluids found in literature. Even when no nanoparticles are added, the thermal conductivity is found to be around 2.5 times larger. It should be taken into account that measuring the thermal conductivity of liquids is much more complicated than measuring the thermal conductivity of solids.

Conclusion
Although there has been success when working with water based fluids, the thermal conductivity measurements performed in these experiments are not reliable. Other methods of measuring thermal conductivity should be explored in order to compare results.