

Abstract Submitted
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Improvements in 3-omega measurement of thermal conductivity for nanostructured materials CHUANLE ZHOU, M. GRAYSON, Electrical Eng. Comp. Sci., Northwestern University, Evanston IL, USA, G. KOBLMUELLER, Walter Schottky Institut, Tech. Univ. Munich, Germany — Nanostructured materials have reduced thermal conductivity in order to enhance the thermoelectric figure of merit (ZT). The 3ω method is widely used for vertical thermal conductivity measurements in the nanostructure materials, especially layered materials. The challenge for this method is to measure the small 3ω voltage at the third harmonic, above the comparably large ω voltage from the sample at the fundamental frequency, complicated by the nonlinear signal from other components in the measurement circuit. We carefully study the 3ω method [Cahill, Rev. Sci. Instrum. 61 (2), 802 (1990)] and develop a strategy to increase the signal to noise ratio of the data, for more accurate results. We also investigate an alternate sample preparation geometry for the 3ω measurement, so that the heat flow is vertical and linear through the thin film instead of cylindrical as is standard for this method. This results in a direct measurement of the vertical thermal conductivity in such an anisotropic material. New geometries for measuring lateral thermal conductivity will also be proposed and explored.

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