NUMERICAL CORRECTION OF TOPOGRAPHY ARTIFACTS IN SCANNING THERMAL MICROSCOPY

MARTINEK Jan, KLAPETEK Petr, HORÁKOVÁ Mirka, MIRANDA Alberto, MCKAY Brian

Czech Metrology Institute, Brno, Czech Republic, EU

Brunel University London, London, United Kingdom, EU

Abstract

The images measured using Scanning Thermal Microscopy (SThM) depend on both the thermal conductivity and surface topography of the sample. Commonly, the main goal of the measurement is to the study the material properties regardless of the actual surface morphology. The interaction between the tip and the sample leads to a certain value of thermal resistance at each given pixel. In order to understand the heat flow and further analyze the material properties the Finite Element Method has been used for modelling the measurement process. The geometry of the model comes from the topography channel or from the known pattern of the sample. This approach has been used to estimate the thermal conductivity of multiwalled carbon nanotubes (MWCNT's). There are three objects involved in the model - the tip, the carbon nanotube and the substrate. Still, there are unknown thermal contacts between all these objects and the simulation leads to rough estimation of the heat flow and thus some quantification of the carbon nanotube's thermal conductivity is calculated.

Keywords: Scanning thermal microscopy, finite element method, multiwalled carbon nanotubes, thermal conductivity

Author did not supply full text of the paper.