Optical anisotropy in micromechanically rolled carbon nanotube forest

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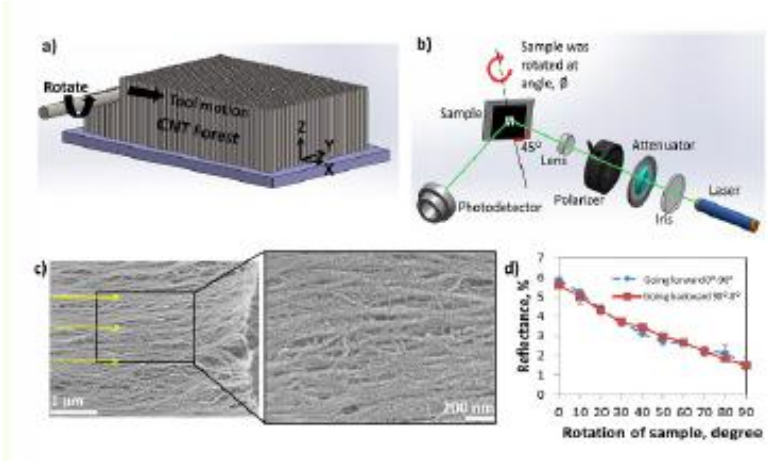
Abstract

The bulk appearance of arrays of vertically aligned carbon nanotubes (VACNT arrays or CNT forests) is dark as they absorb most of the incident light. In this paper, two postprocessing techniques have been described where the CNT forest can be patterned by selective bending of the tips of the nanotubes using a rigid cylindrical tool. A tungsten tool was used to bend the vertical structure of CNTs with predefined parameters in two different ways as stated above: bending using the bottom surface of the tool (micromechanical bending (M2B)) and rolling using the

side of the tool (micromechanical rolling (M2R)). The processed zone was investigated using a Field Emission Scanning Electron Microscope (FESEM) and optical setup to reveal the surface morphology and optical characteristics of the patterned CNTs on the substrate. Interestingly, the polarized optical reflection from the micromechanical rolled (M2R) sample was found to be significantly influenced by the rotation of the sample. It was observed that, if the polarization of the light is parallel to the alignment of the CNTs, the reflectance is at least 2 x higher than for the perpendicular direction. Furthermore, the reflectance varied almost linearly with good repeatability (~10%) as the processed CNT forest sample was rotated from 0° to 90°.



Keywords

carbon nanotube forest micromechanical rolling micromechanical bending optical anisotropy optical polarization

Preview

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