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Study on micro-patterning process of vertically aligned carbon nanotubes (VACNTs) (Article)

Mohd Asyraf, M.R.[a], Rana, M.M.[a], Saleh, T.[a], Fan, H.D.E.[c], Koch, A.T.[c], Nojeh, A.[c], Takahata, K.[c], Suriani, A.B.[b]

[a] Smart Structures, Systems and Control Research Laboratory (S3C RL), Faculty of Engineering, Department of Mechatronics Engineering, International Islamic University Malaysia, PO Box 10, Kuala Lumpur, Malaysia

[b] Faculty of Science and Mathematics, Department of Physics, Universiti Pendidikan Sultan Idris, Tanjung Malim, Perak, Malaysia

[c] Department of Electrical and Computer Engineering, University of British Columbia, Vancouver, BC, Canada

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Abstract

Vertically aligned carbon nanotubes (VACNTs) have drawn significant attention by the researchers because of their nanometric size and favorable material properties. Patterning of CNT forests in the micrometric domain is very important for their application in the area of microelectromechanical system (MEMS). For the first time this paper reports, detailed experimental investigation on a post growth μ-patterning process of VACNT forests. The micromechanical bending (M2B) process was locally applied at the targeted area in order to change the alignment of VACNT forests. Interestingly, the VACNT forest was transformed from typical black body absorber to reflective mirror as the M2B process was applied. Several parameters were identified that govern the resultant patterns such as rotational spindle speed, lateral bending speed, step size, tool morphology, and total depth of bend. Optimization of the parameters was carried out experimentally to obtain the best surface roughness and integrity of the microstructure. A minimum average surface roughness of Ra = 15 nm was achieved with 2000 rpm spindle speed, 1 mm/min bending speed and 1 μm step size. © 2016 Taylor & Francis Group, LLC.

Author keywords

3-DMicro fabrication; Carbon nanotubes; MEMS; micromechanical bending

Indexed keywords

Engineering controlled terms: Carbon; Electromechanical devices; Forestry; MEMS; Nanotubes; Surface roughness; Yarn

Average surface roughness; Experimental investigations; Micro electromechanical system (MEMS); Micro-mechanical; Patterning process; Reflective mirrors; Surface roughness and integrities; Vertically aligned carbon nanotube

Engineering main heading: Carbon nanotubes

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