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An ex-situ [method to convert vertically aligned carbon nanotubes array to horizontally aligned carbon nanotubes mat](#) (Article)Islam, S.^a, Saleh, T.^a, Anwar, M.R.M.^a, Mohamed Ali, M.S.^{a*}^aDepartment of Mechatronics Engineering, International Islamic University Malaysia, PO BOX 10, Kuala Lumpur, 50728, Malaysia^bSchool of Electrical Engineering, Universiti Teknologi Malaysia, UTM Johor Bahru, Johor, 81310, Malaysia

Abstract

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[Carbon nanotubes](#) (CNTs) have been attracted by the researchers for their extraordinary properties and wide applications in various fields. Among numerous types of CNTs, the [horizontally aligned CNTs](#) (HACNTs) has shown many advantages due to its nano-structural features and proper arrangements. HACNTs open new opportunity in the field of microwave, nanoelectronics, and heat dissipation system. This article reports the study on the post-growth processing technique (mechanical) to transform [vertically aligned carbon nanotubes](#) (VACNTs) [array](#) into [HACNTs mat](#). The above technique has been named as micromechanical rolling (MIR) that uses a rotating rigid cylinder to bend and align the individual [nanotubes](#) in the VACNTs [array](#). The process yielded remarkably arranged (horizontal) [nanotubes](#) with a resultant smooth surface. Various process parameters such as tool rotational speed, lateral speed, and step size were investigated in this study to achieve the smooth surface of [HACNTs array](#). It was observed that the minimum surface roughness of $R_a = 4$ nm was achieved with 2000 rpm of the tool's rotational speed, 1 mm min⁻¹ of lateral speed and 1 μ m of step size. © 2018 IOP Publishing Ltd.

Author keywords

[carbon nanotube](#) [carbon nanotube mat](#) [CNTs](#) [horizontally aligned carbon nanotubes](#) [micromechanical rolling](#)

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