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**Surface Roughness Modelling of the Micromechanically Patterned CNT Forests**
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**Abstract**
Introduction: A new method of modelling surface roughness of the resultant structure from various parameters in the microforming of CNT forests has been developed. One of the top-down mi-croforming methods of CNT forests is called micromechanical bending (M2B). The method uses a high-speed rotating spindle to compact and flatten the surface of CNT forests. It results in the surface structure becoming smoother and increased reflectance of the surface. The reason for this phenomenon is the porosity that decreases by bending CNTs, hence preventing light from passing through. Moreo-ver, the surface roughness is also significantly reduced. However, a study has yet to be conducted to estimate the theoretical value of surface roughness from the identified parameters. Aim: This research aims to develop an approach to model the surface roughness of resultant surface from a set of parameters in a micropatterning method. Methods: Experiments were conducted using a CNC machine to pattern onto CNT Forests using specific parameters, such as 1000, 1500, and 2000 rpm (spindle speed) with feed rates of 1, 5 and 10 mm/min. The step size was kept fixed at 1 μm for each level of the patterning pass. It was found that the periodic pattern of trochoidal mark was engraved on the surface, contributing to the value of measured surface roughness. Results: The results were compared with the theoretical value from the calculation of surface roughness using trochoidal motion with the assumption of the grain sizes of 0.2 μm, 0.3 μm, and 0.4 μm. The actual value of surface roughness was measured using the XE-AFM machine. The grain of 0.2 μm produced the same experimental trend with the theoretical value at rotational speeds of 1000, 1500, and 2000 rpm. However, the theoretical result was shifted downward because the surface could return to the original position due to the elastic properties of the CNTs, hence reducing the surface roughness. The best-fit result was reported for the grain of 0.4 μm, rotational speed of 2000 rpm, and speed rate of 1 mm/min, showing less than 1% difference. Conclusion: Experimentally and theoretically, a good agreement and comparable results proved the effectiveness of the proposed estimating method. © 2023 Bentham Science Publishers.

**Author Keywords**
CNT forests; microbending; micromechanical bending (M2B) method; modelling; surface roughness; thermal; μEDM

**Index Keywords**
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