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Effect of Cell Morphology on Electrical Properties and Electromagnetic Interference Shielding of Graphene- Poly (Methyl Methacrylate) Microcellular Foams

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Abstract: Nowadays, polymer-based foams have gained much attention for absorption of electromagnetic wave due to their desirable properties such as wide absorption band, low reflection and also light weight. However, the impact of the foam morphology including shape, cell size and its structure as open and close cell, on the electromagnetic wave has been rarely investigated. In this study, the operational conditions for manufacturing various structured foams based on poly (methyl methacrylate) / graphene nanoparticle sheets have been optimized for investigating the effect of cellular structure on the characteristics of electromagnetic wave as well as electrical properties. Hence, a foaming system with great controllability and repeatability has been employed. It should be noted that this system is capable of stabilizing the cellular structure with millisecond accuracy during and after the pressure drop. The close cell structured foam showed a decrement in the electrical and electromagnetic properties with increasing the cell size and shifting from spherical to polygonal shape. Moreover, the results related to the prepared open cell structured foams with similar cell size and density to close cell ones, have demonstrated higher absorption characteristics for microcellular open cell foams while shielding was better in close cell counterparts.

Keywords: Microcellular foam, Cell structure, Electrical conductivity, Electromagnetic interference shielding.