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Implication of Multi-Walled Carbon Nanotubes on Polymer/MXene Nanocomposites

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Abstract : MXene nanosheets stack in polymer matrices, while multi-walled carbon nanotubes (MWCNTs) entangle themselves when used to form composites. These challenges are addressed in this work by forming MXene/MWCNT hybrid nanofillers by electrostatic self-assembly and developing elastomer/MXene/MWCNTs nanocomposites using a latex compounding method. In a 3-phase nanocomposite, MWCNTs serve as bridges between MXene nanosheets, leading to nanocomposites with well-dispersed nanofillers. The high aspect ratio of MWCNTs and the interconnection role of MXene serve as a basis for forming nanocomposites of lower percolation threshold of electrical conductivity from the hybrid fillers compared with the 2-phase composites containing either MXene or MWCNTs only. This study focuses on discussing into detail the interfacial interaction of nanofillers and the elastomer matrix and the outstanding mechanical and functional properties of the resulting nanocomposites. The developed nanocomposites have potential applications in the automotive and aerospace industries.

Keywords : elastomers, multi-walled carbon nanotubes, MXenes, nanocomposites
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