

PROCEEDINGS

Structural Design and Processing of Polymer-Based EMI Shielding Composites for Harsh Environments

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ABSTRACT

The development of high-performance polymer-based electromagnetic interference (EMI) shielding composites is a critical challenge for replacing traditional metals in harsh application environments. Based on our previous research in fabricating ultra-efficient polymer/3D metal network composites, this work introduces two novel strategies. First, through *in-situ* reduction of silver on fiber surfaces coupled with silver ion coordination reaction, we developed a heterogeneous interface enhancement strategy. This facilitates the construction of highly efficient 3D conductive metal networks within a fiber-reinforced polyphenylene sulfide matrix, enabling multifunctional integration suitable for demanding conditions. Second, to address the high-reflection characteristic of conventional EMI shielding materials, we proposed asymmetric conductive network and progressive conductivity network structures. By constructing multi-level asymmetric conductive networks, we achieved ultra-efficient EMI shielding effectiveness while maintaining extremely low electromagnetic wave reflection. This work provides valuable insights for the high-performance design and large-scale processing of advanced polymer-based EMI shielding composites.

KEYWORDS

Electromagnetic interference shielding; polymer composites; heterogeneous interface enhancement; low reflection

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