Conductive Polymer Composites Based on Co-continuous Polymer Blends with Interfacial Graphene

Technology #20170087

Conductive Polymer Composites Manufacturing

A new technique manufactures conductive polymer composites (CPCs) using co-continuous polymer blends with interfacial graphene as the conductive filler. This technology combines two current CPC manufacturing methods with an innovative approach to create CPCs with superior electrical properties. The approach uses polylactic acid (PLA) and polystyrene (PS) co-continuous polymer blends as the polymer matrix of CPCs, and selectively localizes 2D conductive fillers (graphene sheets) at the interface of the blends. The interface between the two immiscible polymers of the co-continuous blends provides a percolating scaffold for graphene, whose superior electrical properties facilitate the conduction of electric charges. The research team is currently working to extend the approach to several other polymer matrices.

Less Filler, Less Sloughing, More Applications

Cost-effective preparation of effective CPCs with strong mechanical properties is challenging using conventional methods. Current CPCs require high conductive filler loadings or incorporation of expensive conductive polymers, both of which significantly limit broader application of these materials. For example, high loading results in weak mechanical properties and filler sloughing, which can contaminate electronic devices.

This technology offers a new process of manufacturing economically viable CPCs with good electrical properties. The sparse nature of the interface, the large aspect ratio of graphene and reduced graphene oxide (r-GO) as the conductive component work together to significantly reduce the amount of conductive fillers needed to fabricate CPCs. This technology benefits CPCs through less sloughing and improved quality at a lower manufacturing cost.

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BENEFITS AND FEATURES:

- Less filler (graphene) required
- Improved electrical properties
- Good mechanical strength
- Lower manufacturing costs

APPLICATIONS:

- Electrostatic discharge (ESD) protection (e.g., antistatic packaging materials for electronic components, fuel components in automobile industry)
- Electromagnetic interference (EMI) shielding (e.g., disk drive components in computers, cleanroom components for susceptible electronic devices)
- Conductive polymers

Phase of Development - Working prototype

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