TYPE Editorial
PUBLISHED 23 May 2023
DOI 10.3389/fmats.2023.1216973

OPEN ACCESS

EDITED AND REVIEWED BY
Robert Li,
City University of Hong Kong, Hong Kong SAR, China

*CORRESPONDENCE
Vineet Kumar,
vineetfri@gmail.com

RECEIVED 04 May 2023
ACCEPTED 19 May 2023
PUBLISHED 23 May 2023

CITATION
Tam L-h, Lee D-J and Kumar V (2023), Editorial: Polymer composites based on nanofillers: design, properties, and applications.
Front. Mater. 10:1216973.
doi: 10.3389/fmats.2023.1216973

Editorial: Polymer composites based on nanofillers: design, properties, and applications

Lik-ho Tam[1], Dong-Joo Lee[2] and Vineet Kumar[2]*

[1]School of Transportation Science and Engineering, Beihang University, Beijing, China, [2]School of Mechanical Engineering, Yeungnam University, Gyeongsan, Republic of Korea

KEYWORDS

nanofillers, polymer composites, properties of composites, applications of composite, structural design

Editorial on the Research Topic
Polymer composites based on nanofillers:design, properties, and applications

Normally, raw and non-vulcanized polymer matrix is sticky, soft, and exhibits poor mechanical, electrical, and thermal properties. In order to improve such properties of polymer matrix, different nanofillers have been used as the reinforcements, such as carbon nanotube, graphene, clay minerals, and silica, and different processing techniques have been developed, such as vulcanization. Accordingly, the uniformly mixed nanofillers could significantly improve mechanical properties and resistance to degradation and aging of polymer matrix. The polymer composite with enhanced properties has vast scope for industrial applications, such as composite insulators, sensors, vacuum bag prepreg, and components used in severe flight environment. This Research Topic is recently organized to collect scientific and engineering advances in the composition design, property analysis, and industrial applications of polymer composite, which includes four articles.

For outdoor high-voltage power transmission, silicone rubber and glass fiber-reinforced polymer (GFRP) composites have been increasingly used as shed and core insulators. Gafti et al. showed that the shed material made of silicon rubber achieved the highest stability voltage and endurance voltage with the addition of 5 wt% TiO_2, and the least erosion loss and highest wetting angle with 25 wt% TiO_2, while the core material made of GFRP possessed the highest tensile strength of 88 MPa with 10 wt% glass fiber (Gafti et al.). Meanwhile, graphene/polymethyl methacrylate (PMMA) composite has been used as sensor to detect formaldehyde emission. Wang et al. determined that graphene/PMMA composite film achieved the best sensitivity with a frequency shift of 6.9 kHz at an operating temperature of 120°C with the film thickness of 2.2 μm (Wang et al.). For aerospace applications, alkali-free glass fiber fabric prepreg has been applied in load-bearing structures. Wang et al. reported that after the curing time of 40 min at the temperature of 80°C, followed by the curing temperature at 127°C for 2 h, the porosity of the prepreg reduced, and the tensile strength and short beam shear strength increased, compared with generally used aerospace composites (Wang et al.). Furthermore, composites are used as flexible thermal protection system in severe aerospace environments. Using mathematical modeling and numerical analysis, Cao et al. showed that the front shock wave of the flexible inflatable structure significantly shifted backward as the flight Mach number increased from 14.3 to 24.6, and the temperature and pressure on the windward side were higher than those on the leeward side, while the flexible inflatable structure maintained a good aerodynamic shape under extreme aerodynamic heat and force (Cao et al.).

The contributions in this Research Topic provide a comprehensive reference for structural design, property analysis, and industrial applications, which could inspire the development of high-performance and durable polymer composite in different engineering fields. Our editorial team members are grateful to all the authors for their efforts in this Research Topic and also to the reviewers for their rigorous and professional support of this Research Topic.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Acknowledgments

The authors thank all the authors and reviewers for their valuable contributions as well as the support from editors at the publisher.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note