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Haikun Wu, Yuanyuan Qi, Zhongyang Wang, Wen Zhao, Xiaomin Li, Lei Qian

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Low percolation threshold in flexible graphene/acrylic polyurethane composites with tunable negative permittivity

Haikun Wu[1], Yuanyuan Qi[2], Zhongyang Wang[1], Wen Zhao[1], Xiaomin Li[1], Lei Qian*[,1]

[1]Key Laboratory for Liquid-Solid Structural Evolution and Processing of Materials (Ministry of Education), Shandong University, 17923 Jingshi Road, Jinan 250061, China

[2]Shandong University of Traditional Chinese Medicine, 16369 Jingshi Road, Jinan 250061, China

*Corresponding author, E-mail: *qleric@sdu.edu.cn;*

Tel : +86-531-88393396

Haikun Wu and Yuanyuan Qi contributed equally to this work.

Abstract

Graphene (GR)/acrylic polyurethane (APU) composites with low percolation threshold and tunable negative permittivity were prepared by coating and pressing method. The microstructures and dielectric properties including alternating current conductivity (σ_{ac}), reactance (Z'') and permittivity (ε' and ε'') were investigated in detail. A percolation phenomenon from σ_{ac} was observed when the GR content was increased from 0.9 to 6 vol%, and the percolation threshold was 1.8 vol%. The percolation threshold was obviously lower than those from the reported carbon/silicon nitride, carbon nanotube/phenolic resin and GR/phenolic resin composites, which was possibly attributed to the well dispersion and unique microstructure of GR in APU. Moreover, the negative permittivity was obtained from the much lower GR content