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

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### 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 ( $\sigma_{ac}$ ), reactance ( $Z''$ ) and permittivity ( $\epsilon'$  and  $\epsilon''$ ) were investigated in detail. A percolation phenomenon from  $\sigma_{ac}$  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

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