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Free-standing Functional Graphene Reinforced Carbon Films with Excellent Mechanical Properties and Superhydrophobic Characteristic

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Abstract

In this work, we reported a simple method to fabricate novel free-standing stiff carbon-based composite films with excellent mechanical properties and superhydrophobic behaviors. The free-standing stiff carbon composite films based on reduced graphene oxide/glassy carbon (rGO/GC) were prepared by the combination of *in-situ* polymerization and carbonization process. The obtained composite films exhibited excellent mechanical properties by the addition of rGO nanosheets. It was found that incorporating 0.5 wt.% of rGO sheets in GC precursors resulted in enhancements of 99% in strength (202.6 MPa) and 184% in modulus (33.8 GPa), respectively. More interestingly, carbon nanoarrays were uniformly grown on the

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