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Hydrated Aramid Nanofiber Network Enhanced Flexible Expanded Graphite Films towards High EMI Shielding and Thermal Properties

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ABSTRACT

Expanded graphite (EG) films are known for high electric and thermal transportation properties, due to light oxidation preparation process compared with chemical converted graphene (cGE) films. However, the poor mechanical properties and brittle nature are the major limitations for commercial applications. To meet this challenge, in this work, hydrated aramid nanofiber (HANF) with excellent mechanical properties and flexibility is introduced into EG films to enhance their mechanical properties and flexibility. As a result, only the adding of 2 wt% HANF can endow EG films with good flexibility. The best comprehensive property is achieved by adding 10% HANF (EG-10). Compared with the pure EG films (EG-0), a 223% improvement of tensile strength from 7.5 Mpa to 24.2 Mpa and a 660% enhancement of elongation at break from 0.371% to 2.82% are observed for EG-10. Besides, EG-10 maintains good electric and thermal conductivities of 215 S cm^{-1}, 208 W m^{-1} K^{-1}. Moreover, the EMI shielding property of 34.9 dB is realized when the film thickness reaches only 30 μm. The EG/HANF films can be used up to the temperature of 300 °C and show good flame

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