Multifunctional reduced graphene oxide reinforced natural rubber foams

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Graphene-based nanocomposites have attracted extensive interest due to their exceptional mechanical, electrical, and chemical properties. Reduced graphene oxide (rGO), in particular, is widely studied, with L-ascorbic acid (L-AA) emerging as a sustainable reducing agent that achieves a comparable C/O ratio to traditional chemicals while promoting environmentally friendly synthesis. In addition to its reduction capability, L-AA facilitates the self-assembly of graphene sheets into a three-dimensional (3D) porous hydrogel via π-π interactions, enhancing structural stability. [1]

In this work, we propose a novel one-step approach by directly incorporating a water-soluble latex polymer (polyisoprene rubber) during the reduction process, yielding an RGO/polyisoprene nanocomposite hydrogel(Fig 1.). After freeze-drying, the resultant aerogel exhibits excellent mechanical stability and an RGO loading of up to 17%. Furthermore, Fe_3O_4 magnetic nanoparticles can be integrated into the RGO framework during hydrothermal treatment, expanding its functionality. This method offers a versatile and scalable pathway for fabricating RGO/latex nanocomposites via an AA reduction sol-gel process, with promising applications in advanced material design, particularly for electromagnetic interference (EMI) shielding and multifunctional nanocomposite development.

References

[1] Z.X. Jia, M.F. Zhang, B. Liu, F.C. Wang, G. Wei, and Z.Q. Su, Journal, 3(2020) pp. 6140-6252.

Figures

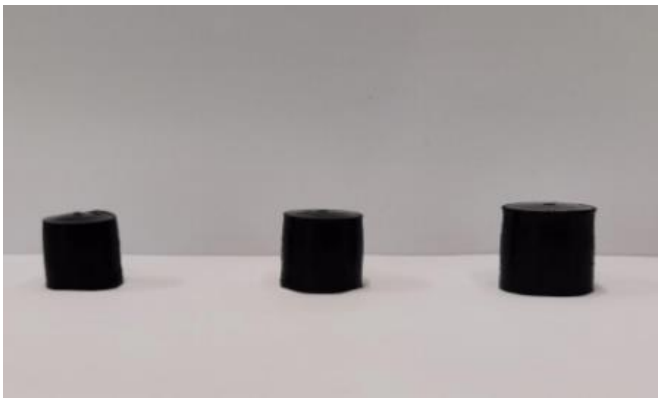

Figure 1: RGO/latex hydrogel nanocomposite

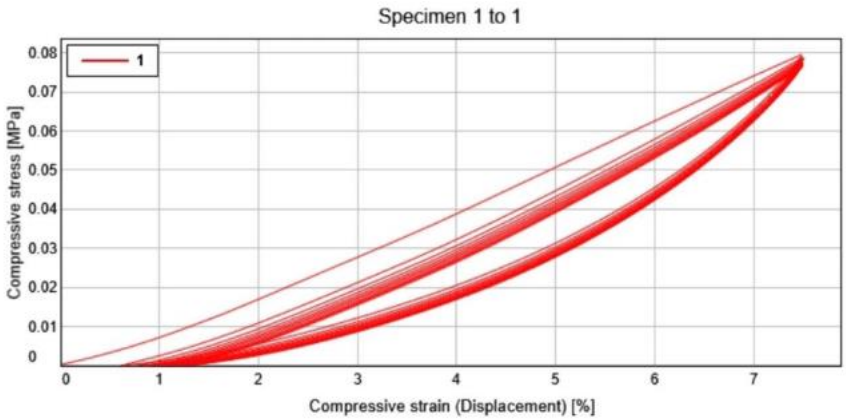

Figure 2: RGO/latex aerogel nanocomposite compression testing result