

A Universal Graphene Free-Standing Paper Design Strategy to Achieve Excellent Electrical Conductivity Graphene Paper: Graphene Soft Porous Sheets, Graphene Quantum Dots, and Graphite Nanoplates

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Free-standing paper Graphene (Fsp-G) has been used in many applications, such as lithium-ion batteries, supercapacitors, and electromagnetic interference (EMI) shielding. The present work aims at offering a universal study on making high electrical conductivity Fsp-G by various reduction methods, different source materials (GO, Graphite), and the new design of mixing original precursors with graphene soft porous sheets, graphene quantum dot, and graphite nanoplates. Fsp-G from GO reduction with hydrazine vapor by solvothermal formed highly porous graphene paper and moderate EC at 2,397 S/m, which could be applied in EMI shielding application. While graphite nanoplate could be self-assembled to perform a superior high EC graphene paper due to its defect-free crystallize structure, as high as 297,282 S/m. However, its mechanical properties were not excellent, which is easily broken by the flexibility test. Finally, Fsp-G achieved from the new design of mixing GO with holey graphene, GO with GO quantum dots are not only archived a high EC at 259,902 S/m and 122,132 S/m, respectively; but also stiffer than those made from pristine sheets alone.