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Green graphene oxide and reduced graphene oxide

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Due to these remarkable characteristics, graphene oxide (GO) has garnered extensive attention for its diverse applications. When bio char, coal char, graphite undergoes oxidation, its transforms into GO, characterized by oxygen-containing functional groups and offering increased hydrophilicity and compatibility with different materials. Synthesis methods for GO include chemical oxidation of graphite, such as the Hummers' and Ana's method. The electrochemical exfoliation of graphite in the presence of an electrolyte yields GO with advantages as scalability, precise control over thickness, quality, and environmental friendliness. Derived from GO by reducing oxygen-containing functional groups, reduced graphene oxide (rGO) exhibits restored conductivity, improved mechanical strength, and reduced oxygen content. Reduction methods for rGO include thermal reduction, chemical reduction using agents like hydrazine or ascorbic acid, and electrochemical reduction. The electrochemical shows advantages include mild conditions, precise control over reduction levels, compatibility with scalable production and environmental friendliness. Both GO and rGO find applications in flexible electronics, transparent conductive films, sensors, supercapacitors, lithium-ion batteries, fuel cells, reinforcement in polymers and coatings for corrosion protection, drug delivery systems, tissue engineering, biosensors. Ongoing research focuses on improving electrochemical synthesis methods, exploring new applications, and enhancing material properties. However, challenges such as scalability, cost-effectiveness, and standardization of production processes remain areas of interest for further development.