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Insights: Publications

Low-damage nitrogen incorporation in graphene films by nitrogen plasma treatment: Effect of airborne contaminants

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Graphene films grown on copper by chemical vapor deposition were exposed to the late afterglow of a reduced-pressure N2 plasma sustained by microwave electromagnetic fields. X-ray photoelectron and Raman spectroscopies reveal extremely high incorporation of plasma-generated N atoms into the graphene film (N/C = 29%) while maintaining an unprecedentedly low-damage generation (D:G = 0.35–0.45) compared to the literature (0.5–2.5). The incorporation dynamics between graphene on copper and graphene on copper oxide are also compared and discussed. After transfer on SiO2/Si substrate, the N/C content decrease to only 6%. This reveals that a large part of the N atoms are weakly bonded to the graphene surface. Most of the nitrogen incorporation seems linked to the functionalization of weakly bonded hydrocarbons initially adsorbed from air exposure or carbon-nitrogen structures arising from plasma-surface interactions.
