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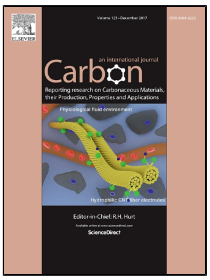

Scanning Atmospheric Plasma for Ultrafast Reduction of Graphene Oxide and Fabrication of Highly Conductive Graphene Films and Patterns

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Abstract

A new method based on scanning atmospheric plasma for an ultrafast reduction of graphene oxide (GO) and preparation of highly conductive graphene films and patterns is presented. This simple method is shown to provide a direct and scalable fabrication of graphene films on flexible and shaped substrates with variety patterns for broad applications. An effective and ultrafast (~ 60 s) reduction of GO films into highly conductive graphene films at room temperature is demonstrated by this process impossible to achieve by conventional wet chemical and thermal reduction process. The software controlled x-y scanning unit allows fabrication of graphene films with variety of patterns on different substrates including glass, plastic, ceramics and metals with complex shapes required for flexible and wearable electronics and devices. Characterization results confirmed that a thin transparent graphene film can be produced with a surface sheets resistance of 22 kΩ/sq at the transparency of 88 %, and a thick film (~25 µm) with a sheet resistance of 186 Ω/sq. A practical application of