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Surface treatment of polyimide substrates for the transfer and multitransfer of graphene films

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ABSTRACT

This work explores the use of polyimide substrates for the development of flexible graphene-based devices. Single layer graphene was synthesized by chemical vapour deposition and transferred to untreated and treated polyimide substrates. Of the four different surface treatments, the tetrafluoromethane/oxygen plasma and, especially, hydrochloric acid bath treatments showed the best performance, as they reduced the resistivity of the graphene samples by as much as 46%. At the same time, resistivity was also reduced by as much as 96% due to the increase in the graphene coverage area as a result of repeating the transfer process up to four times. The combination of HCl treatment and transfer iteration led to the samples acquiring a sheet resistance of 800 Ω /sq. To the best of our knowledge, this is the lowest value ever reported in the literature for graphene samples on conventional flexible polymeric substrates and, in particular, in polyimide, the most widely used material for flexible applications. This result represents a major contribution to the development of graphene-based flexible devices.

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