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Roll-to-roll production of 30-inch graphene films for transparent electrodes¹

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The outstanding electrical, mechanical and chemical properties of graphene make it attractive for applications in flexible electronics. However, efforts to make transparent conducting films from graphene have been hampered by the lack of efficient methods for the synthesis, transfer and doping of graphene at the scale and quality required for applications. Here, we report the roll-to-roll production and wet-chemical doping of predominantly monolayer 30-inch graphene films grown by chemical vapour deposition onto flexible copper substrates. The films have sheet resistances as low as ~ 125 Ohm/sq with 97.4% optical transmittance, and exhibit the half-integer quantum Hall effect, indicating their high quality. We further use layer-by-layer stacking to fabricate a doped four-layer film and measure its sheet resistance at values as low as ~ 30 Ohm/sq at $\sim 90\%$ transparency, which is superior to commercial transparent electrodes such as indium tin oxides. Graphene electrodes were incorporated into a fully functional touch-screen panel device capable of withstanding high strain.

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