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Novel highly conductive graphene-based materials MONICA CRACIUN, IVAN KHRAPACH, THOMAS BOINTON, FREDDIE WITHERS, DMITRY POLYUSHKIN, WILLIAM BARNES, SAVERIO RUSSO, University of Exeter — The development of future flexible and transparent electronics relies on novel materials, which are mechanically flexible, lightweight and low-cost, in addition to being electrically conductive and optically transparent. Currently, tin doped indium oxide (ITO) is the most wide spread transparent conductor in consumer electronics. The mechanical rigidity of this material limits its use for future flexible electronic applications. We report novel graphene-based transparent conductors obtained by intercalating few-layer graphene (FLG) with ferric chloride (FeCl3). Through a combined study of electrical transport and optical transmission measurements we demonstrate that FeCl3 enhances the electrical conductivity of FLG by two orders of magnitude while leaving these materials highly transparent [1]. We find that the optical transmittance in the visible range of FeCl3-FLG is typically between 88% and 84%, whereas the resistivity is as low as 8.8 Ω. These parameters outperform the best values found in ITO (i.e. resistivity of 10 Ω at an optical transmittance of 85%), making therefore FeCl3-FLG the best candidate for flexible and transparent electronics.

[1] I. Khrapach, F. Withers, T. H. Bointon, D. K. Pplyushkin, W. L. Barnes, S. Russo, M. F. Craciun, Adv. Mater. 24, 2844 (2012).

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