High Performance Transparent Conductive Films using Rheologically-Derived Reduced Graphene Oxide

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We produced large area graphene oxide (GO) sheets with fewer defects on the basal plane by application of shear stress in solution to obtain high quality reduced graphene oxide (RGO) sheets without the need for post annealing processes. This is described as rheologically-derived RGO which is shown in Figure 1a. The large area GO sheets were generated using a homogenizer in aqueous solution, which induced slippage of the GO in the in-plane direction during the exfoliation process, in contrast with the conventional sonication method. The effects of chemical reduction under mild conditions demonstrated that the formation of structural defects during the exfoliation process affected the RGO properties. In the Raman spectra, the I_D/I_G ratio of the homogenized-RGO (HRGO) increased more than that of the sonicated-RGO (SRGO) due to the large number of ordered sixfold rings on the basal plane. The enhanced sheet resistance of the HRGO thin film was found to be 2.2 kohms/sq at 80% transmittance as shown in Figure 1b. This result is comparable to the values reported by others in studies of the optoelectrical properties of RGO using hydrazine reduction.[1-5] The effective exfoliation method has great potential for application to high performance RGO-transparent conducting films.

References

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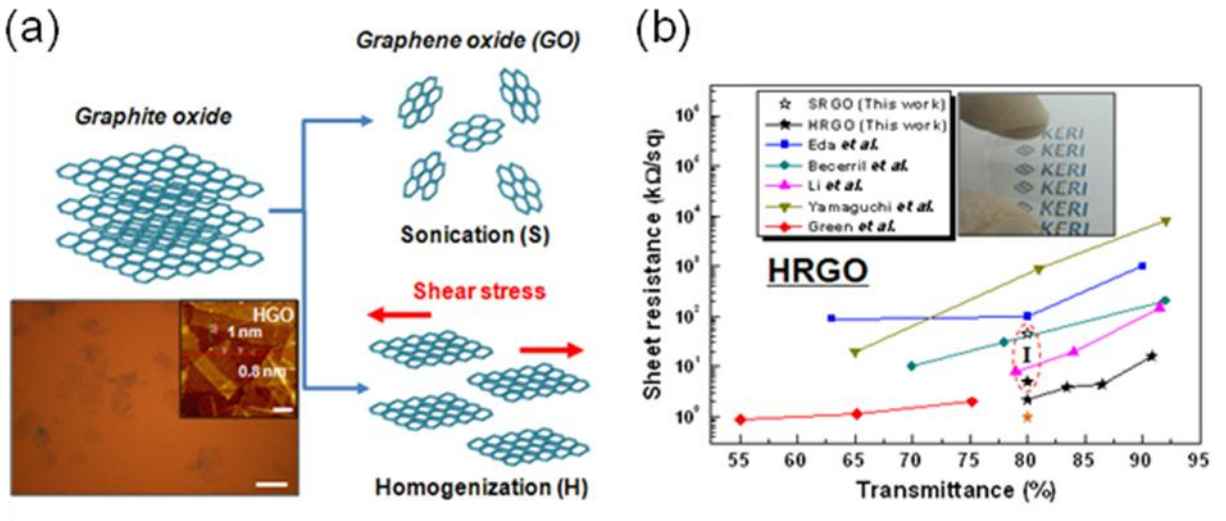
Figures



(a) Schematic diagram for the exfoliation mechanism of GO via sonication (S) or homogenization (H), and optical and AFM image of the homogenized GO samples. (b) Sheet resistance *vs.* transmittance plot of RGO-TCFs fabricated from previously reported results and our work.