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Facile preparation and thermoelectric properties of reduced graphene oxide

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[Background]

This report demonstrates application of reduced graphene oxide (rGO) for wearable thermoelectric generators. The rGO is prepared by a simple hydrothermal method, in which polyethylenimine (PEI) and potassium hydroxide (KOH) is used as a reducing agent of graphene oxide (GO) grown by the modified Hummers method. In literatures, the structural and morphological studies reveal the degree of reduction, which is also verified by the D-band/G-band ratio in Raman spectra (I_D/I_G). The sp^2/sp^3 ratio in X-ray photoelectron spectroscopy (XPS) of RGO indicates a significant increase in the intensity of C=C bond character, while the oxygen content decreases manifestly after the reduction is complete [1-4]. In this report, we focus on p-type and n-type thermoelectric characteristics.

[Experimental]

Figure 1 shows a facile approach of *in-situ* reduction of GO with PEI and KOH as a reducing agent and its surface modification to obtain conducting rGO.

[Result and Discussion]

Morphological properties were investigated with scanning electron microscopy (SEM). As shown in Fig. 2, it depicts that the synthesized GO and rGO has a nanosheets structure like graphene with wrinkles and folded regions. Figure 3 shows the macroscopic physical pellet samples for thermoelectric characterization.

From Hall measurement at room temperature, p-type rGO pellet has a carrier concentration about 3.95×10^{19} cm^3, a resistivity of 2.71×10^{-3} ohm-cm, and a mobility of 58.3 cm^2/V-s and n-type rGO composite pellet has a carrier concentration about 1.53×10^{20} cm^{-3}, a resistivity of 2.57×10^{-3} ohm-cm, and a mobility of 15.9 cm^2/V-s.

[Conclusion]

We made nanosheets structures of p-type and n-type rGO by hydrothermal method and measured its carrier concentration and mobility. Currently, we are investigating Seebeck coefficient and thermal conductivity of synthesized rGO.

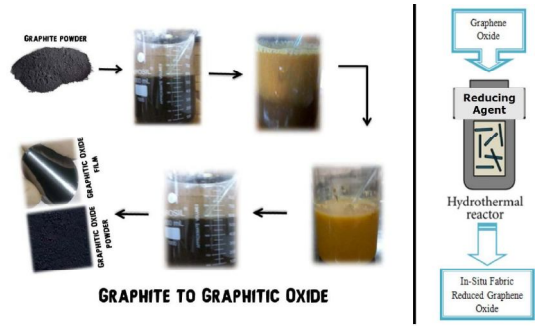

Fig.1: Preparation process of RGO

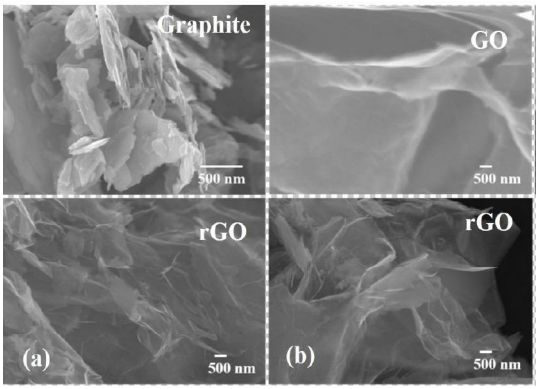

Fig.2: SEM image of as synthesized

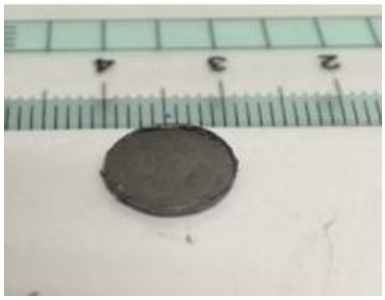

Fig.3: feature of its pellet

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