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Preparation and Characterization of Polyethylenimine Functionalized as Reduced Graphene Oxide for Thermoelectric Applications

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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) is used as a reducing agent of graphene oxide (GO) grown by the modified Hummers method. In literatures, the structural and morphological studies revel 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 n-type thermoelectric characteristics.

[Experimental]

Figure 1 shows a facile approach of *in-situ* reduction of GO with PEI 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 Figure 2 (a), it depicts that the synthesized RGO has a nanosheet structure like graphene with wrinkles and folded regions. Figure 2(b) shows the macroscopic physical pellet samples for thermoelectric characterization.

From Hall measurement at room temperature, n-type RGO composite pellet has a carrier concentration about $1.95x10^{20}$ cm^{-3}, a resistivity of $2.5x10^{-6}$ ohm-cm, and a mobility of 12.7 cm^2/V-s.

[Conclusion]

We made nanosheet structures of 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.

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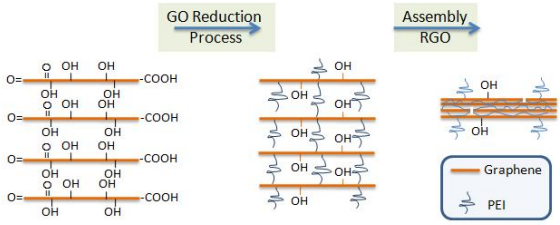
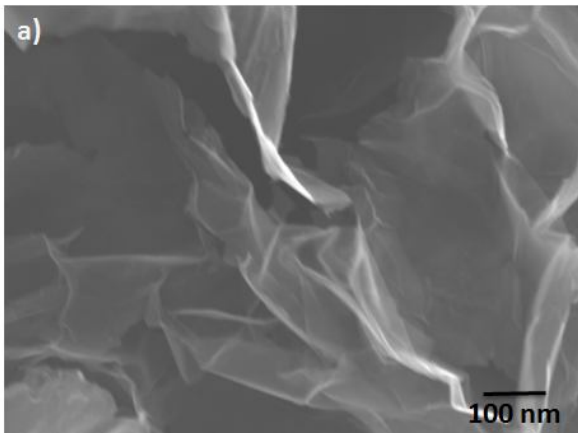


Fig.1: Preparation process of RGO



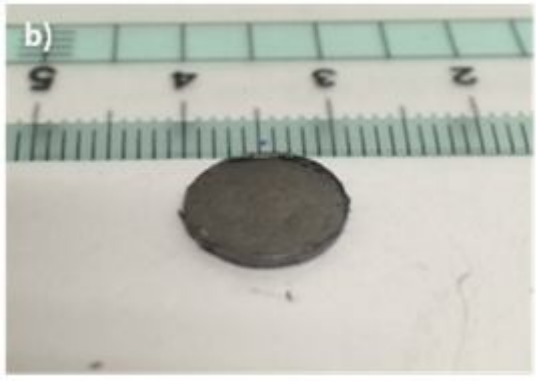


Fig.2: (a) SEM image of synthesized RGO and (b) feature of its pellet

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