Data Article

Microstructure and chemical analysis data of polyurethane-silver nanoparticles/graphene nanoplates composite fibers

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Abstract

In this data article, we provide field emission scanning electron microscopy (FE-SEM) and energy dispersive X-ray spectroscopy (EDS) images of wet-spun polyurethane (PU)-silver nanoparticles (AgNPs)/graphene nanoplatelets (GNPs) composite fibers according to the content of AgNPs and GNPs. In addition, microstructural changes of PU-AgNPs/GNPs composite fibers due to heat treatment at various temperatures are provided. The data collected in this article is directly related to our research article “Stretchable and Electrically Conductive Polyurethane- Silver/Graphene composite fibers prepared by wet-spinning process” [1].

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1. Data

The data presented in this article consists of a series of FE-SEM images of PU-AgNPs/GNPs composite fibers with AgNPs and GNPs content and their thermal treated samples. In addition, surface and cross-sectional EDS images of PU-AgNPs/GNPs composite fibers were provided. As shown in Figs. 1–4, we prepared the wet-spun PU-AgNPs composite fibers with 30, 40, and 50 vol% AgNPs and observed the surface microstructure changes of PU-AgNPs composite fibers with various content of AGNPs and GNPs were prepared by wet-spinning. A 1 cm fiber was selected randomly and observed their surface morphology and chemical composition.

Fig. 5 shows the microstructure and EDS mapping images of the wet-spun PU-AgNPs/GNPs composite fibers with 40 vol% AgNPs and 2.5, 5.0, 7.5, and 10 vol% GNPs. As shown in Fig. 5, the It is observed that the AgNPs uniformly distributed in the PU-AgNPs/GNPs composite system by EDS analysis of Ag element. The EDS chemical element mapping images of the PU-AgNPs composite fiber shows that the AgNPs were uniformly dispersed in the entire system. Because C element mapping images represents carbon in both the PU matrix and GNPs, it is difficult to distinguish C signal of GNPs directly from C element mapping.

2. Experimental design, materials and methods

The PU-AgNPs/GNPs composite fibers were prepared by wet-spinning method [1]. And then, the PU-AgNPs/GNPs composite fibers were thermally cured at 90, 110, 130, and 150 °C for 10 minutes. In order to perform surface analysis, 1 cm of fiber was selected randomly, and the microstructure of the wet-spun PU-AgNPs and PU-AgNPs/GNPs composite fibers were examined using field emission scanning electron microscopy (FE-SEM; JSM–7100F, Jeol). The EDS chemical element mapping images were obtained simultaneously using energy dispersive X-Ray spectroscopy (EDS) interconnected with FE-SEM instrument.
**Fig. 1.** Surface FE-SEM and EDS images of the wet-spun PU-AgNPs composite fibers with the various AgNPs contents and thermal treated at 90 °C.

**Fig. 2.** Surface FE-SEM and EDS images of the wet-spun PU-AgNPs composite fibers with the various AgNPs contents and thermal treated at 110 °C.
Fig. 3. Surface FE-SEM and EDS images of the wet-spun PU-AgNPs composite fibers with the various AgNPs contents and thermal treated at 130 °C.

Fig. 4. Surface FE-SEM and EDS images of the wet-spun PU-AgNPs composite fibers with the various AgNPs contents and thermal treated at 150 °C.
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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Seung-Woo Kim, Sung-Nam Kwon, Seok-In Na, Stretchable and Electrically Conductive Polyurethane- Silver/Graphene composite fibers prepared by wet-spinning process, Compos. B Eng. 167 (2019) 573–581.