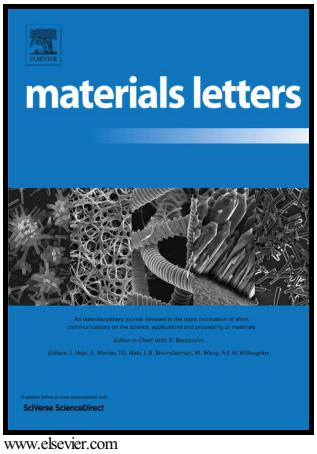

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Sijun Xu, Jiangchao Song, Chunhong Zhu, Hideaki Morikawa

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Graphene oxide-encapsulated Ag nanoparticle-coated silk fibers with hierarchical coaxial cable structure fabricated by the molecule-directed self-assembly

Sijun Xu[a, b], Jiangchao Song[b, c, *], Chunhong Zhu[b], Hideaki Morikawa[b]

[a] *School of Textile and Clothing, Nantong University, Nantong 226019, P. R. China*

[b] *Faculty of Textile Science and Technology, Shinshu University, 3-15-1 Tokida, Ueda, Nagano 386-8567, Japan*

[c] *Sericultural Research Institute, Jiangsu University of Science and Technology, Zhenjiang, 212018, China*

Jiangchao Song, E-mail: sjc200505@163.com

Abstract

Herein, we designed graphene oxide (GO)-encapsulated Ag nanoparticle (AgNP)-coated silk fibers with GO serving as the protective film through hyperbranched poly(amide-amine) (HBPAA)-directed self-assembly for protecting AgNP coatings from detachment. Robust, hard, and closely fitted protective films were achieved on the fiber surfaces through self-assembled GOs by introducing 2D GO nanosheets. Silk fibers were hierarchically coated with HBPAA-capped AgNPs (HBPAA/AgNPs) and GOs by successively impregnating the fibers in solutions of HBPAA/AgNPs and GOs to design a well-defined hierarchical structure. In such structure, HBPAA served as a "double-sided tape" not only gluing AgNPs to the fiber surfaces but also adhering GOs to the surfaces of HBPAA/AgNPs. The developed coaxial cable-structured coatings could isolate Ag nanocoatings from external stimuli, opening a potential route to improve the function persistence and biosafety of AgNP-coated biotextiles.

Keywords: directed self-assembly; carbon materials; biomaterials; nanoparticles

1. Introduction