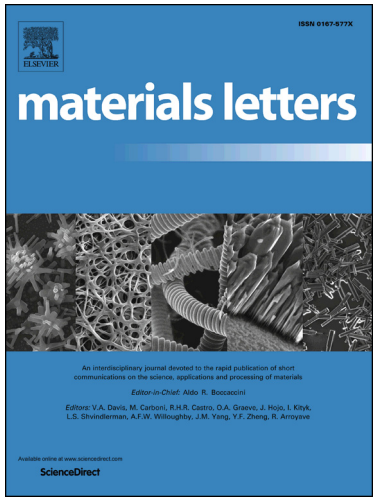

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Graphene-mediated self-assembly of gold nanorods into long fibers with controllable optical properties

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ABSTRACT

The paper presents graphene-templated self-assembly of gold nanorods into long fibers with controllable optical properties. It is shown that the size of self-assembled nanostructures varies with time and is controlled by chemical reactions between amine groups of graphene and the functional groups of gold. The absorption peak of the nanostructures changes over time while the photoluminescence intensity is quenched. The self-assembled nanostructures with variable plasmon resonance effects are potentially usable for the fabrication of nanoscale devices for biomedical applications.

Keywords: Optical materials and properties**;** Self-assembly; Nanorod, Graphene; Gold; Luminescence

1. Introduction

There is a great interest in gold nanorods (NRs) with shaped-controlled optical properties for various applications such as cell imaging, cancer therapy, biosensing, and fabrication of nanoscale devices [1]. Au NRs possess unique optical properties due to their high optical extinction cross-section in the range of visible and near-infrared wavelengths and strong localized plasmonic fields at the tips [2]. As a result, the usage of Au NRs has recently expanded beyond traditional applications to include functions in biomedical, diagnostic, catalytic, and sensing areas [3]. As the collective oscillations of the electrons surrounding the metallic nanorods and thus the intensity and wavelength of surface plasmon resonance are highly shape and size dependent [4], self-assembly of Au NRs into one-dimensional nanostructures with varying aspect ratios and optical properties is very interesting field of study. The formation of structured nanomaterials by self-assembly of nanoparticles through selective and controllable non-covalent interactions provides a powerful tool for the fabrication of nanoscale devices with unique properties [2]. Nevertheless, integration of particles at molecular and nanoscale levels in order to attain specific optoelectronic