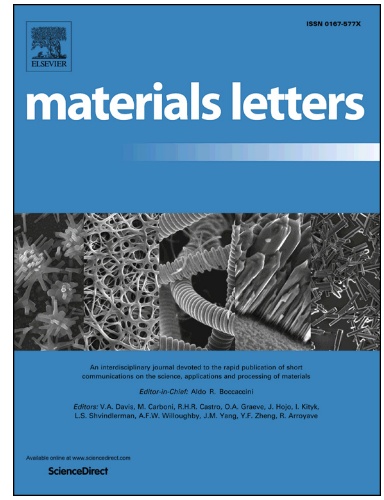


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# Synthesis and drug delivery property of silica nanotubes prepared using gelatin nanofibers as novel sacrificed template

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## Abstract

Silica nanotubes were prepared using the gelatin nanofibers as novel sacrificed template via a sol-gel route with a subsequent calcination process. FT-IR spectrum showed that the siloxane bonds (Si-O-Si) were involved in the silica nanotubes. SEM observations showed that the silica nanotubes had an average diameter of 742±82 nm with a hollow cavity of 513±68 nm. The formation of the tubular hollow structure was attributed to the removal of gelatin template. After soaked in the solution of tetracycline hydrochloride (TH, one of the representative antibiotics) as model drug, the silica nanotubes favored the adsorption of TH with the loading efficiency of 38%. A sustained release behavior of TH was observed as the TH-loaded silica nanotubes were soaked in the phosphate buffer saline. The released TH was biologically active to strongly inhibit the growth of bacterial E. coli.

Keywords: Biomaterials; Sol-gel preparation; Colloidal processing; Silica nanotubes

## 1. Introduction

Silica nanotubes are of special interest in the development of drug delivery systems because of their unique one-dimensional tubular hollow structure, strong hydrophilicity and excellent biocompatibility [1-3]. In particular, their tubular hollow structure could support immobilization of therapeutic substances such as drugs [1], genes [2] and biological growth factors [3]. Numerous methods are available for preparation of silica nanotubes, including thermal evaporation [4], centrifugal jet spinning [5], and template-directed sol-gel route [2-3]. Compared with other methods, template-directed sol-gel route is the most favorable method as the structure of the resultant silica nanotubes could be facilely adjusted by controlling the structure and composition of the templates [6]. Recent researches have indicated that protein nanofibers such as lipid and collagen are good template for preparation of silica nanotubes as they contain a large number of functional groups such as amino and carboxyl groups [7-8]. Collagen is the most abundant proteins in the living tissues and shows excellent biocompatibility and biodegradability [9]. Our recent studies have found that the reassembled collagen nanofibers were good templates to produce silica nanotubes [6-7, 9]. However, as is known, collagen is normally too expensive to be