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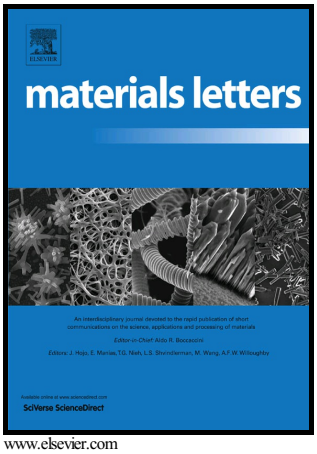

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Facile fabrication of gold particles decorated silk-on-silk nanocapsules

Bo Du[a], Hongwei Wang[a, b], Hongbo Tang[c], Man Guan[a], Jingjie Wang[a], Zhe Zhang[a], Zhimin Zhou[a],* Qiqing Zhang[a,]*

[a]*Institute of Biomedical Engineering, Chinese Academy of Medical Sciences & Peking Union Medical College, Tianjin Key Laboratory of Biomedical Materials, Tianjin, 300192, PR China*

[b]*Institute of Chinese Materia Medica, Chengde Medical University, Hebei Key Laboratory of Research and Development for Traditional Chinese Medicine, Chengde, Hebei 067000, PR China*

[c]*Department of Pharmacy, Beijing Obstetrics and Gynecology Hospital, Capital Medical University, Beijing 100026, PR China*

E-mail: zhouzhiminf@126.com, zhangqiq@126.com

Abstract

Both protein capsules and gold nanoparticles have attracted considerable attention in drug delivery systems. In this study, silk fibroin nanocapsules were fabricated by silk-on-silk layer-by-layer (LbL) assembly onto poly[lactic-co-(glycolic acid)] (PLGA) sacrificial templates followed by core removal. Subsequently, hybrid nanocapsules were fabricated by physical adsorption of DNA modified gold nanospheres and nanorods. These hybrid LbL-nanocapsules have potential applications for targeted drug delivery or combination therapy.

Key words: biomaterials; silk nanocapsules; gold; nanoparticles; layer-by-layer; hybridization

1. Introduction

In drug delivery systems, polymeric vehicles with hollow interiors, especially layer-by-layer (LbL) capsules, have attracted enormous interest in recent years due to their distinct advantages for encapsulation, protection and delivery of active ingredients.[1-6] The original LbL technique is based on the simple alternative adsorption of oppositely charged polyelectrolytes on a sacrificial template via electrostatic interactions followed by core removal. The potential cytotoxicity arising from synthetic cationic components and time-consuming procedures of charge-compensated LbL-capsules stimulate the development of single-component capsules created by various synthetic polypeptides or natural biomacromolecules.[7-10] The shell thickness of polymeric capsules synthesized by one-step assembly can be regulated by adjusting molecular weight or the desolvated mass of shell composites.[8,9] Alternatively, microcapsules with controlled shell thichness were synthesized through hydrophobic interactions driven LbL assembly using silk fibroin, a biodegradable, biocompatible and excellent