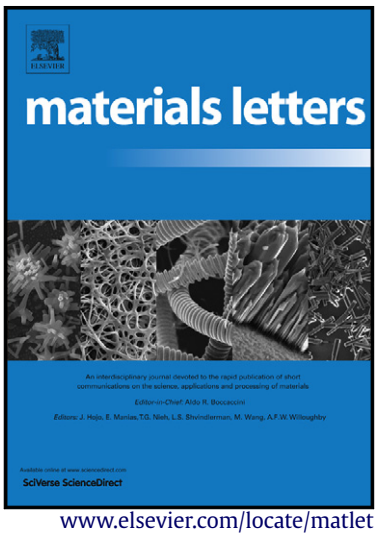

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Template-assisted chemical synthesis of Au opal photonic crystal film with complete photonic band gaps in the visible

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Abstracts

Three-dimensionally (3D) ordered Au sphere array (opal) films are fabricated through a combination of templating synthesis and chemical reduction deposition. First, large area crack free silica inverse opal films are prepared by the co-assembly of polystyrene (PS) colloidal spheres and silica precursor, followed by a thermal treatment to remove the PS and transform the precursor to silica; then Au is infiltrated into the void spaces of the silica inverse opal by chemical reduction deposition. Subsequent removal of the silica template produces 3D periodic arrays of Au spheres. The prepared Au opal photonic crystal film composed of ~ 510 nm diameter Au spheres possesses two complete photonic band gaps in the visible region.

Keywords: Optical materials and properties; Photonic crystal; Au opal films; Complete photonic band gap; Chemical reduction deposition; Crystal structure

1. Introduction

Metallic photonic crystals with three-dimensionally (3D) period micro- or nano-structures have gained extensive attention because of their wide range of applications in optics, magnetics, sensing, catalysis, and surface-enhanced Raman spectroscopy (SERS) [1-8]. In particular, developing metallic

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