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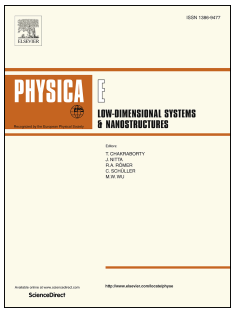

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PII: S1386-9477(18)30951-2

DOI: 10.1016/j.physe.2018.09.019

Reference: PHYSE 13293

To appear in: *Physica E: Low-dimensional Systems and Nanostructures*

Received Date: 5 June 2018

Revised Date: 4 September 2018

Accepted Date: 16 September 2018

Please cite this article as: S. Huang, C. Ding, S. Guo, Y. Hao, M. Zhang, X. Wang, T. Lu, X. Xu, A. Li, Y. Deng, R. Liu, The realization of isotropic multiplexing diffraction patterns and polarization property by two-dimensional imprinting silica periodic photonic crystals, *Physica E: Low-dimensional Systems and Nanostructures* (2018), doi: https://doi.org/10.1016/j.physe.2018.09.019.

The realization of isotropic multiplexing diffraction patterns and polarization property by two-dimensional imprinting silica periodic photonic crystals

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Abstract:

Multiplexing optical devices realized by 2D photonic crystals is a feasible way and hot research topic. Especially, dielectric photonic crystals with isotropic multi-point far-filed diffraction patterns and high diffraction efficiency are essential for the development of multiplexing optical system in optical communication field. However, the fabrication of high quality photonic crystals based on SiO_2 dielectric material with large surface area and strict periodicity remains a great challenge. This paper presents a single-step nanoimprint route to fabricate two-dimensional silica photonic nanostructures using silica sol-gel solution combined with substrate conformal imprint lithography (SCIL) technique. The imprinted silica photonic nanostructures, with strictly periodicity of cylindrical imprinted pattern and uniform aspect ratio in a glass substrate with 4 inches, have a good multi-channel diffraction performance in transmission mode and the transmission efficiency can be reached up to 80% at a broad wavelength band. Furthermore, the change of polarization direction in output multi diffraction beams is consistent with the variation of the polarization direction of the injected laser light, which shows potential application as multiplexing devices. The finding provides a low cost and fast imprint method to fabricate high quality 2D silica photonic nanostructures and their outstanding optical performance make them become important components or fundamental building blocks in integrated on chip optical or optoelectronic devices, such as light division multiplexing system.

Key word: silica photonic crystal; SCIL; far field diffraction; multi-point diffraction; polarization