Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Tunable rainbow trapped in a self-similar liquid crystal waveguide QING HU, SI-HUI WANG, DI-HU XU, YU ZHOU, RU-WEN PENG, MU WANG, National Laboratory of Solid State Microstructures and Department of Physics, Nanjing University, Nanjing 210093, China — We have investigated the optical propagation through a self-similar dielectric waveguide, where a hollow core is surrounded by a coaxial Thue-Morse multilayer. It is found that due to the self-similar furcation feature in the photonic band structure, the transmission multibands are achieved. And different frequency ranges of the transmission modes can be selectively guided and spatially confined along the waveguide. Consequently, a rainbow can be trapped in the waveguide. Then by infiltrating liquid crystal into the cladding layers, the transmission modes and rainbow trapping can be tuned by altering the temperature. And transverse electric (TE) and transverse magnetic (TM) polarizations present different propagating features. The attenuation and energy density distributions of different modes in the waveguide are also discussed. The finding can be applied to designing miniaturized compact photonic devices, such as a spectroscopy on a chip, color-sorters on a chip, and photon sorters for spectral imaging. Reference: Qing Hu, Jin-Zhu Zhao, Ru-Wen Peng, Feng Gao, Rui-Li Zhang, and Mu Wang, Appl. Phys. Lett. (2010) 96, 161101; and Qing Hu, Ru-Wen Peng, Si-Hui Wang, and Mu Wang, manuscript prepared(2011).

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Date submitted: 26 Nov 2011 Electronic form version 1.4