Nanotek-2013

OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference on
Nanotek & Expo

December 2-4, 2013 Las Vegas, USA

Self-organized organic photonic crystals for laser applications

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Abstract

This presentation shows the recent development of self-assembled photonic crystals (PCs) of organic and polymer materials, such as chiral liquid crystals (CLCs) and colloidal crystals (CCs), for laser applications. Both CLCs and CCs have intrinsic capabilities to spontaneously assemble 1D-PC and 3D-PC structures, respectively. When a periodic length in the PC structures of CLCs and CCs corresponds to several hundred nanometers in the light wavelength, the photonic band-gaps (PBGs) can be visualized as Bragg reflection colors. When fluorescence dyes are embedded in the CLCs and CCs, the stimulated laser action at PBG band edge(s) or within the PBG wavelength can be generated by optical excitation. Moreover, the optically-excited laser action is controllable by external stimuli due to the self-organization of CLCs and CCs. This presentation highlights not only the research backgrounds of CLC and CC structures as PCs, but also the experimental results of their soft and tunable laser applications. We believe that a wide variety of CLC and CC structures will play leading roles in the next-generation of optoelectronic devices of organic and polymer materials.

Biography

Seiichi Furumi received Ph.D. from the Tokyo Institute of Technology in 2001. During his Ph.D. studies, he was also a Research Fellow for Young Scientists of the Japan Society for the Promotion of Science. After his Ph.D. studies, he worked as a Postdoctoral Researcher of the Communications Research Laboratory. In 2004, he held a permanent position of the National Institute for Materials Science (NIMS). From 2010, he concurrently started a research project as a PRESTO Researcher of the Japan Science and Technology Agency (JST). Since 2012, he also served as an Associated Professor of the University of Tsukuba.