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In-situ study on optical properties and continuous laser tuning in cholesteric liquid crystal laser array

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Cholesteric liquid crystals (CLCs) have become promising candidates for photonic crystal laser devices owing to their unique optical characteristics in mirror less lasing, as well as micron-sized thickness, low threshold, and lasing tunability in the full visible spectral range. In this paper, we introduced *in-situ* study on optical properties and continuous laser wavelength tuning in cholesteric liquid crystal laser array. General and polymerized CLC laser devices were fabricated to have fine-structured pitch gradient in a wedge CLC cell and to have tuning resolution less than 0.3 nm in abroad spectral range. The comprehensive optical properties of the laser lines and fluorescent spectrum generated by a CLC laser array were studied; the laser lines generated from a CLC with a right-(left-) handed circular helix were right-(left-) handed circular polarized, respectively. We found out that inside the photonic band gap, the CLC structure with right-(left-) handed helicity suppressed the fluorescence generated with right (left) circular polarized light, and instead the suppressed right (left) circular polarized light energy moved to the outside of the photonic band gap, so we can say that the fluorescence intensity outside of the photonic band gap is enhanced with right (left) handed circular polarized light. Depending on the position of the photonic band gap, the fluorescence quantum yield value increased by up to ~15%. And the polymerized CLC devices had good stability for a time of more than 1 year, and in response to strong external laser light sources, and thermal perturbation. And dynamic laser tuning by electric field and temperature control were also studied.

Biography

Mi-Yun Jeong is an Associate Professor in the Department of Physics at Gyeongsang National University, Jinju, Korea. She received her BS degree from Gyeongsang National University, and her MS (2001) and PhD (2007) degrees from Korea University, under the guidance of Prof. D. G. Lim. Her current research interests include the second-order nonlinear optical effects of octupolar crystals, nanophotonics, plasmonics, and continuous tunable cholesteric liquid-crystal lasers. She has published 39 papers in peer-reviewed journals.

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