Self-Assembled Conjugated Organic/Polymer Microcavities for Optical Resonators and Lasers

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Optical microcavities play an important role for the next-generation light technology. Recently, we succeeded in fabricating spherical microcavities from π-conjugated polymers (CPs) by simple self-assembly process (Fig. 1).[1] We found that the microcavities show whispering gallery mode (WGM) resonant photoluminescence (PL) upon focused laser excitation, where PL generated inside the sphere is confined via total internal reflection at the polymer/air interface.[2–8] The resonance occurs when the wavelength of the light is an integer multiple of the circumference of the microsphere. The CP-based microcavities have benefits to the conventional microcavities in the following points: [1] simple and low-energy fabrication process to obtain well-defined microspheres, [2] the microcavities function as both cavity and emitter, [3] the microcavities have high refractive index and photoabsorptivity, and [4] potent use for electrically-driven WGM and laser oscillation. In this presentation, recent results on the fundamentals of the self-assembly of the CPs, resonant PL from the CP microspheres, intra- and intersphere light energy conversion, and the future prospects to realize light-, electrically-, and chemically-driven WGM and lasing will be presented.

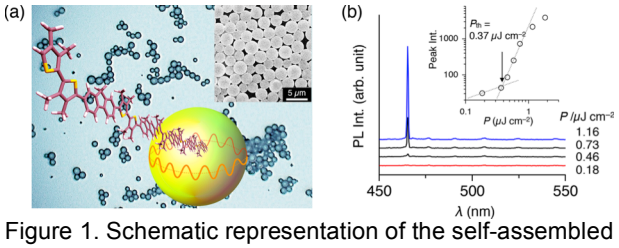

Figure 1. Schematic representation of the self-assembled conjugated polymer microspheres, optical and SEM micrographs, and lasing spectra.

References

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