

## Polymer photonic crystal for active optical device applications

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### 【Outline of survey】

This research project is focused on creation of organic and polymer photonic materials and devices based on molecular building blocks and nano-micro-scale device fabrications. Polymer materials investigated in this study possess  $\pi$ -electron conjugated molecular system with largely enhanced efficiency of nonlinear optical response and quantum yield of emission. Molecular design and synthesis of novel polymer system is achieved by the modification of building blocks in the dendritic structure because large enhancement of molecular hyperpolarizability can be achieved in such a supramolecular structure. Research interest is in demonstrating the potential of high-performance polymer materials for revolutionary components and devices. These include polymer photonic crystal devices leading to a large reduction in operating energies. To fulfill this project, the program focuses on three thrusts, “molecular design and synthesis”, “polymer nano-micro scale fabrication technique”, and “optical device measurement and application”.

### 【Expected results】

Polymer photonic materials and devices with revolutionary performance will be produced to provide unprecedented impact to future information and telecommunications technologies. Device performance is based on the large enhancement of optical response in nonlinear optics and emission control in the optical devices such as the photonic crystal. Photonic crystal is characterized by its optical properties such as slow light emission, emission enhancement, and nonlinear optical enhancement. Therefore, polymer photonic crystal device is expected to work at a very low energy with high efficiency, leading to the application of optical polymer device in its practical uses.

### 【References】

- S. Yokoyama, T. Nakahama, S. Mashiko, M. Nakao, M. Yamada, K. Nishio, and H. Masuda, “Photonic Crystal Templates for Organic Solid-state Laser”, Appl. Phys. Lett., 87, pp. 191101 1-3 (2005).
- S. Yokoyama and S. Mashiko, “Dendrimers for Optoelectronic Applications”, In “Topics in Current Chemistry, Dendrimer V”, Ed. by C. A. Schalley and F. Vogtle, Springer-Verlag Berlin Heidelberg, pp. 205-226 (2003).

**【Term of project】** FY2007 - 2011

**【Budget allocation】** 16,400,000 yen

(2007 direct cost)

**【Homepage address】** [http://www.cm.kyushu-u.ac.jp/dv15/Yokoyama\\_Labo.html](http://www.cm.kyushu-u.ac.jp/dv15/Yokoyama_Labo.html)