

Dynamic control of photonic crystal for new functionality

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【Outline of survey】

The goal of this project is to dynamically control photonic crystals, which are artificial materials with periodic refractive index distributions, and to create new functionalities. Although the recent progress of photonic crystal is really remarkable, their characteristics have so far mostly been static: once the structure is made, its characteristics are fixed. If the properties of photonic crystals could instead be changed dynamically and rapidly, significant advances would be expected in areas of photonics. In this project, we realize the dynamic control of the properties of photonic crystal nanocavities and waveguides, which can generate new functionalities such as slowing/stopping light and on-the-fly dynamic wavelength change of propagating light.

【Expected results】

When the dynamic and rapid control of photonic crystals can be realized, new and novel functionalities can be developed. For example, by the dynamic control of the Q factor of photonic crystal nanocavities, deliberately control storage and release photons from nanocavities could be achieved. The dynamic change of the characteristics of photonic crystal waveguides could produce dynamic changes of properties of photons propagating in the photonic crystals. Through this project, we will develop a new academic field called: "*Dynamic Photonic Crystals*".

【References by the principal investigator】

- Y.Tanaka, J.Upham, T.Nagashima, T.Sugiya, T.Asano and S.Noda: "Dynamic control of the Q factor in a photonic crystal nanocavity", *Nature Materials*, Vol.6, pp.862-865 (2007).
- S. Noda, M. Fujita, and T. Asano: "Spontaneous-emission control by photonic crystals and nanocavities", *Nature Photonics*, Vol.1, No.8, pp.449-458 (2007).

【Term of project】 FY2008—2012

【Budget allocation】

160,100,000 yen (direct cost)

【Homepage address】 http://www.kuee.kyoto-u.ac.jp/%7E1ab05/index_e.html