

Name of Technology	Creation of optical functional crystals by the control of host-guest molecular orientation	Chemistry
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Key words	crystal structure, matrix, organic substance, optical functional crystal, host-guest	

What kind of technology is this?

Outline

Preparation method of new optical functional crystals having excellent optical characteristics by the control of the host-guest molecular orientation using inexpensive host (inorganic compound) and guest (organic compound)

Aiming at manipulating the light freely, attempts to produce optical nanostructure photonic crystals and the study of their theoretical design have been conducted by many researchers. The method of producing organic phosphorescence materials requires very harsh conditions. Few studies proposed the general methodology on their industrial-scale production. In this study, by closely examining the behavior of light in crystal along the time axis while controlling optical characteristics (wavelength, intensity, etc.), it is aimed to create a structure capable of developing excellent optical characteristics and delaying the transmission velocity of light to the limit.

By using inorganic matrix and organic molecule, a crystal capable of developing highly efficient optical characteristics has been successfully produced. It was also made clear that its optical characteristics depended on the concentration of organic molecule and its emission wavelength could be controlled by the added concentration of the organic molecule. Furthermore, it was found that the crystal system of host and guest crystals would significantly affect the development of optical characteristics of the composite crystal. A new methodology that will expand the application range of crystal design guide is also under study. The crystallization by cooling used in this study has already been proven effective in the crystal manufacturing using other substances. That is, its application range is very wide.

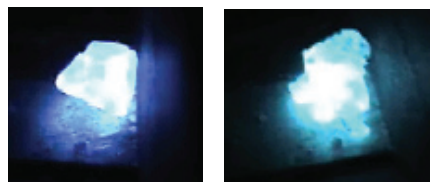


Fig. Light emission behavior of crystals having different host-guest molar ratios

What are its applications?

Since the new optical functional crystal in this study can be produced by using simple structured substances and the conventional equipment, its commercialization is very easy. Based on this result, if new photonic crystals for miniaturization of optical devices can be produced, it will become possible to realize various new technologies, such as the development of micro optical functional device & chip, extremely low-noise optical amplifier, and quantum communication & calculation technology. Furthermore, the author aims to establish the preparation theory of new photonic crystals, with an expectation of its wide application to the industrial field.

Related patents	Japanese Patent application No. 2006-127665
Related materials	N. Doki, H. Seki, K. Takano, H. Asatani, M. Yokota, N. Kubota, Crystal Growth & Design, 4, 5, 949-953 (2004)