

# Creation of High-Performance Thin Holograms based on Polymer Liquid Crystals with Giant Change in Refractive Index

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## 【 Outline of survey 】

Holography, which can enable ultra-high density optical storage and three-dimensional image storage, has been of great interest over a period of years. However, absence of materials with high level of performance required for hologram has been the serious bottleneck from the view point of brightness, sensitivity, response, and thickness. In theory, if materials with a large change in refractive index induced by photoirradiation are developed, a bright hologram can be realized even with a thin film. This project aims at creation of novel polymer liquid crystal materials that can photochemically induce a giant change in their refractive index more than 0.5, which has never been achieved before.

## 【 Expected results 】

In this project, we plan to develop photoresponsive polymer liquid crystals containing a photochromic moiety with fast and reversible response and a mesogenic moiety involved in a large change in refractive index, both of which are directly connected through chemical bonding. A giant change in refractive index photochemically induced in the materials is expected by cooperative molecular motion due to the liquid crystalline nature, allowing the creation of a high-performance thin hologram with fast response, high sensitivity, brightness, and reversibility.

## 【 References by the principal researcher 】

- (1) Directed Bending of A Polymer Film by Light  
Y. Yu, M. Nakano and T. Ikeda,  
*Nature* **425**, 145 (2003).
- (2) Photomodulation of Liquid Crystal Orientations for Photonic Applications  
T. Ikeda,  
*J. Mater. Chem.* **13**, 2037-2057 (2003).

【 Term of project 】 F Y 2004 - 2008

【 Budget allocation 】 81,100,000 yen

【 Homepage address 】 <http://www.res.titech.ac.jp/polymer/index-e.html>