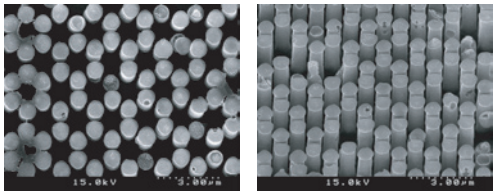
Titanium Dioxide is Crafted into Photonic Nanostructures (Photonic Crystal Structures)

Koichi AWAZU
Photonic Research Institute
e-mail: k.awazu@aist.go.jp
AIST Today Vol. 3, No.4 (2003) 8-10

The Photonics Research Institute of the National Institute of Advanced Industrial Science and Technology (AIST) developed a novel production technology for forming photonic nanostructures (photonic crystal structures) from titanium dioxide. The technology employs X-ray lithography methods based on synchrotron orbital radiation to deeply and precisely form a submicron-order polymeric mask. Then, liquid-phase deposition is used to faithfully deposit a tightly packed layer of titanium oxide onto the template. Finally, the template is selectively removed to obtain a photonic nanostructure. Energy conservation should result if the technology indeed leads to photonic crystals with better light transmittance, lower loss in connections with optical fiber, and less intensive temperature regulation requirements.



Scanning electron microscope observation of photonic crystal of titanium dioxide. The template was creased on PMMA films by deep x-ray lithography. Then, the template was molded by titanium dioxide with the liquid phase deposition. A pillar of 640nm diameter with 2micron height.

New VOF Based Stabilized Finite Element Method for ill-Conditioned Two-Phase Flow

Akira TEZUKA
Research Institute for Computational Sciences
e-mail: tezuka.akira@aist.go.jp
AIST Today Vol. 3, No. 6 (2003) 25

We developed a new VOF (Volume of Fluid) based FEM (Finite Element Method) for two-phase flow, which is generally valid for severe phenomena in industry. The new proposed VOF-FEM provides physically acceptable numerical results on two-phase flows at steel converter and micro-ink jet, for example, which are ill-conditioned problems.