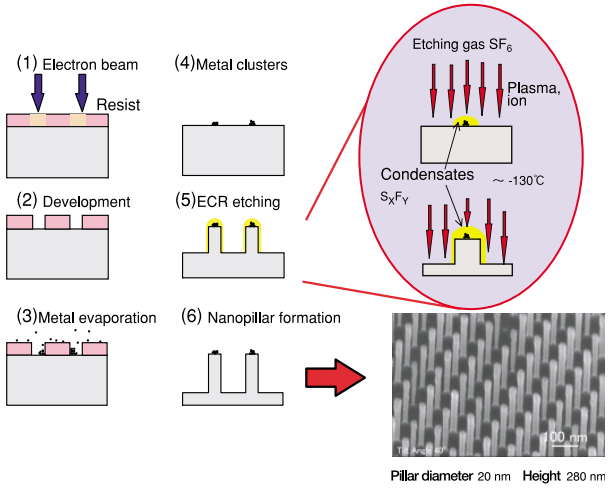
Fabrication of Si Nanopillars and its Application

Tetsuya TADA
Advanced Semiconductor Research Center
e-mail:
t-tada@aist.go.jp
AIST Today Vol. 3, No. 2 (2003) 10

We have developed a fabrication process using self-formation of etching masks with metal clusters as formation nuclei. When Si substrates deposited with metal clusters are subjected to electron cyclotron plasma etching with SF_6 at around -130 °C, reaction products in the plasma, S_xF_y, condense preferentially at the clusters, leading to the self-formation of nanoscale etching masks. As a result, Si pillars, about 10 nm in diameter and 100 nm tall, have been formed with remarkably narrow size-distributions when we use Au clusters (diameter:1 -3 nm). We have also found that Si nanopillars with a very high aspect ratio (~ 20) can be fabricated by using Fe clusters.

This process has been easily combined with electron beam lithography technique, which enables us to define pillar positions. Using this process, we have fabricated field emitters, 2-dimensional photonic crystals with waveguides *etc*.

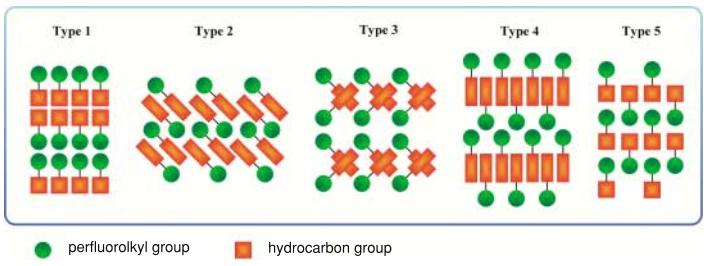


The fabrication process of Si nanopillars

New Crystal Engineering Based on Fluorine-Containing Hybrid Compounds

Taizo ONO
Institute for Structural and Engineering materials
e-mail: t.ono@aist.go.jp
AIST Today Vol. 3, No. 2 (2003) 11

We have recently proposed new crystal engineering utilizing so-called fluorophilic nature of the perfluoro compounds. Our idea is based on the fluorine-containing hybrid compounds, RF-X-RH, consisting of a junction group (X), perfluoroalkyl (RF) and hydrocarbon (RH) moieties. Systematic investigation of the crystal structures of such hybrid compounds revealed the existence of five motifs (Type I to V) in their crystal packings and their relationships with the topology of the molecules. Based on the topology-packing relationship, we designed polymerizable diacetylene derivatives with the Type II packing motif and actually obtained black polymer crystals with metallic luster by solid-state polymerization under uv irradiations.



Five motifs (I-V) found in the crystal packing of the hybrid compounds RF-X-RH.