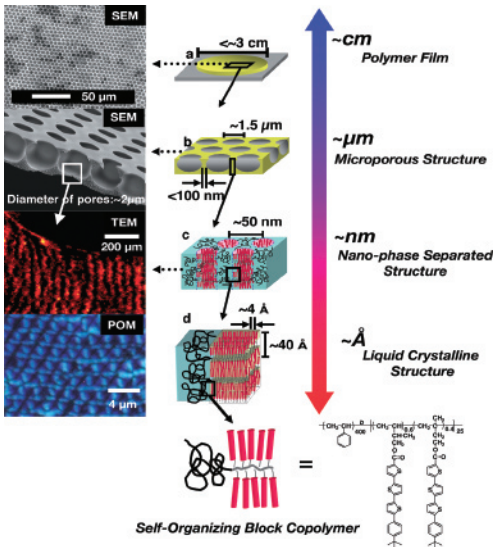
Development of Polymer Thin Films with Hierarchical Structures

We have developed a new strategy for constructing highly ordered hierarchical structures by combining individual self-organizing components over multiple length scales. The specifically designed block copolymer formed organized structures on three-different length scales by combining of a liquid crystalline phase, a phase-separated nanodomain structure and microporous structure, ranging from angstroms to micrometers. The materials prepared by this strategy and modified by further fabrication are expected to have a wide range of applications in molecular optical or electronic devices, photonic band-gap materials, and sensors.



A hierarchical structure within a designed block copolymer thin film

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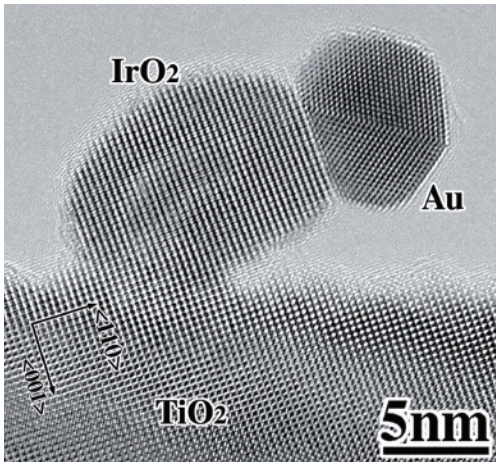
TEM Observation of Complex of Nano-Particle

- Investigation of nano-interfaces -

In order to clarify the synergetic effect of the combination of Au with Ir on the catalytic performance for the oxidative decomposition of dioxins, as a model catalyst, Au and Ir were co-deposited on the single crystal of rutile TiO_2 by deposition-precipitation method. Analyses by means of analytical transmission electron microscope revealed that pillars of IrO_2 on each of which one Au nanoparticles was attached grew on the TiO_2 substrate. This pillar appeared to be formed by self-organization of Au, Ir, and oxygen.



HRTEM image of an Au-Ir deposited on TiO_2

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