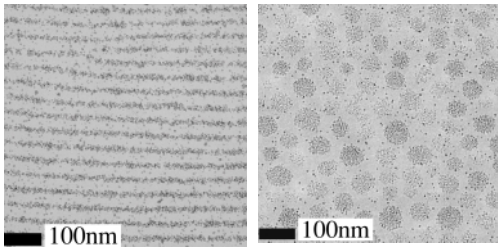
Nano-scale Alignment of Metal Nano Particles within Block Copolymer Films Induced by Reduction of Metal Complex Vapor

We have developed a dry process to achieve nano-scale alignment of metal particles with narrow size distribution within block copolymer films. Vapor of palladium(II) acetylacetonato (Pd(II)AA) is exposed to PS-*b*-PMMA block copolymer film in a nitrogen atmosphere at 180°C for certain time up to 2hr. Pd(II)AA is decomposed and reduced to metallic state to be converted into nano particles. Due to the difference of reducing power between PS and PMMA, the metal particles are selectively assembled within the PS domains, and the periodical array of nano-sized particles is achieved.



Cross sectional view by TEM showing the nano-scale alignment of Pd particles in blockcopolymer films having lamellar (left) and sphere (right) microdomain structures.

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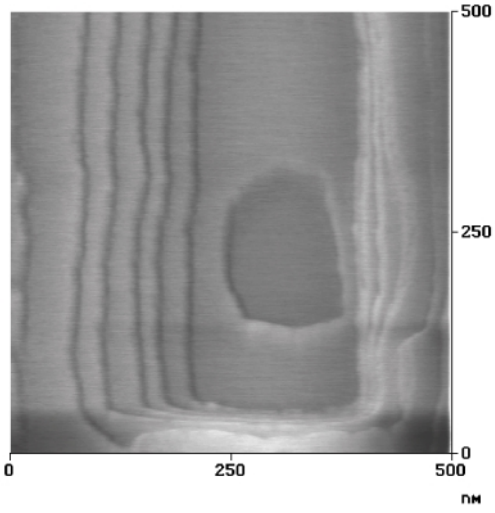
Molecular scale Flattening of Organic Optic Materials by AFM Nano-polishing Method

Organic electro-optic material surface tends to be covered with a degenerated rough layer, which may cause light scattering or unfavorable light transmission. We demonstrate a novel method to remove the layer and flatten the (001) and ($00\bar{1}$) parallel surfaces of 4-dimethylamino-N-methyl-4-stilbazolium tosylate (DAST) crystal on a molecular scale by applying the optimum force on the tip of atomic force microscope (AFM). When the force is kept around 10 nN, the DAST molecules can be removed layer by layer, as shown in the figure. This method has provided a large flat terrace of 300,000 nm^2, and the molecular-scale flatness of this area was confirmed by their molecular image of DAST crystal.



Step-terrace structure of organic single crystal by nano-polishing layer by layer

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