

other. This translates into a lower growth control level. Solution resides in identification of the specific details as well as of the general principles of growth and their personalized application towards preparation of optimized thin films of top quality. This is our approach and goal. Examples in this regard will be introduced.

Keywords: oxide thin films, perovskite, MOCVD

P12.11.41

Acta Cryst. (2008). A64, C559

Reactivity and optical property of diarylethene-gold nanoparticle complex in the film

Hiroyasu Nishi¹, Seiya Kobatake^{1,2}

¹Graduate School of Engineering, Osaka City University, Department of Applied Chemistry, 3-3-138 Sugimoto, Sumiyoshi-ku, Osaka, Osaka, 558-8585, Japan, ²PRESTO, JST, Kawaguchi Center Building, Honcho 4-1-8, Kawaguchi-shi, Saitama 332-0012, Japan, E-mail : m07tc021@ a-chem.eng.osaka-cu.ac.jp

Gold nanoparticles covered with photochromic diarylethene polymers (Au-poly(DE)) or block copolymers with styrene were prepared. These nanoparticles expressed a bright red color because of their surface plasmon resonance absorption, and exhibited reversible photochromism upon alternate irradiation with ultraviolet light and visible light in the solid state as well as in solution. The photocyclization reactivity of the diarylethene chromophores around the gold nanoparticles decreased by shortening the distance between the surface of the gold nanoparticles and the diarylethene chromophore. Some effects of the gold nanoparticles on the optical properties of the diarylethene chromophores were evaluated by comparison of difference spectra between the UV-visible absorption spectra in the photostationary state and in the initial state under various conditions. In the case of Au-poly(DE) that has several-nanometer size of gold core synthesized by Brust' method, the effect was found to appear as a bathochromic shift in the absorption maximum of the diarylethene closed-ring form and the bathochromic shift depends on chain length of the diarylethene polymer and the ambient surroundings. On the other hand, in the case of Au-poly(DE) that has gold core size more than 10 nm synthesized by applying citrate reduction, the surface plasmon resonance absorption of Au-poly(DE) was altered by refractive index change in the diarylethene polymers that are caused by the photoisomerization of diarylethene chromophores. These results show that there are several interactions between the gold nanoparticles and the diarylethene chromophores, and these interactions strongly depend on the particle size, the distance from gold surface to the diarylethene chromophore, and the ambient surroundings.

Keywords: gold nanoparticle, photochromism, polymer

P12.11.42

Acta Cryst. (2008). A64, C559

Polyoxometalate Langmuir-Blodgett films toward two-dimensional molecular crystals

Takeru Ito¹, Hisashi Yashiro², Toshihiro Yamase¹

¹Tokyo Institute of Technology, Chemical Resources Laboratory, R1-21, 4259 Ngatsuta, Yokohama, Kanagawa, 226-8503, Japan, ²Rigaku Corporation, 3-9-12 Matsubara-cho, Akishima, Tokyo, 196-8666, Japan, E-mail : takeito-ra@res.titech.ac.jp

Two-dimensional molecular crystal of polyoxometalate (POM) on

solid substrate is crucial to realizing POM-based molecular devices. Here, regular two-dimensional arrays of POMs with sub-nanometer size were constructed as Langmuir-Blodgett (LB) films by using dimethyldioctadecylammonium (DODA) as cationic partner. The film structure was evaluated by specular X-ray reflectivity (SXR) and grazing incidence X-ray diffraction (GIXD) measurements. Even ring-shaped and ball-shaped nanosized POMs were two-dimensionally arranged onto solid substrates. LB films of planer-shaped Anderson-type POM (hexatungstoantimonate, SbW₆) showed a well-ordered layered structure with a distance of 4.4 nm, in which POM molecules had a two-dimensional square lattice with a length of 1.4 nm. In the case of ellipsoid-shaped photoluminescent POM (decatungstoeuropate, EuW₁₀), the molecular ordering of POM anions was improved to form a regular two-dimensional array by using more concentrated solution of EuW₁₀ in the LB film fabrication. The better molecular arrangement leads to the stronger intensity of the emission by ⁵D₀ to ⁷F₁ transition and the longer emission lifetime. POM nanoring (Mo142, 3.9 nm) and nanoball (Mo132, 2.5 nm) having molecular size compared to small proteins were also incorporated in the built-up LB films having well-defined layered structure. The LB films contained densely packed two-dimensional arrays of Mo142 and Mo132 anions, and their molecular structures and electrochemical characteristics were retained. This verifies that the POM LB films are a promising option to fabricate functional thin films toward a two-dimensionally ordered molecular device.

Keywords: thin films and multilayers, X-ray reflectivity, grazing X-ray diffraction

P12.11.43

Acta Cryst. (2008). A64, C559

A study of polymer thin film formation on quartz substrate by X-ray grazing incidence techniques

Vallerie Ann L. Samson^{1,2}, Pablo P. Saligan², Virginia S. Calix²

¹University of Tsukuba, Graduate School of Pure and Applied Sciences, Tenodai 1-1-1, Tsukuba, Ibaraki, 305-8571, Japan, ²Philippine Nuclear Research Insitute, Commonwealth Avenue, Diliman, Quezon City, Philippines 1101, E-mail : vallerieann@yahoo.com

Thin films of carrageenan, polyvinylpyrrolidone (PVP) and carboxymethylcellulose (CMC) polymers were fabricated by spin-coating aqueous solution of the polymer onto quartz substrate. The thicknesses of the films were varied by varying the process parameters such as concentration of the polymer solution, spin speed and spin time of the spin-coating. Angle-dispersive total-reflection x-ray fluorescence (AD-TXRF) spectroscopy profiles of the three polymers showed film formation only in carrageenan and PVP. The CMC polymer showed an AD-TXRF profile of a bulk sample on top of the substrate. For both carrageenan and PVP, an increase in concentration yielded a corresponding increase in intensity of the fluorescent or scattered peaks. Thicknesses of the thin films were measured by x-ray reflectivity (XRR). For carrageenan, concentration of the polymer solution was the main determinant of final film thickness over other process parameters. The thickness of the films showed a linear relationship with the sulfur fluorescent intensity present in the polymer measured by AD-TXRF. For PVP, poor adhesion of the polymer onto the substrate yielded a limited number of thickness measurements from the XRR profiles.

Keywords: polymers, total reflection X-ray fluorescence, X-ray reflectivity