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Aqueous Dispersion of Nanoparticles using Poly(w-Styrene)-b-Poly(acrylic acid) Block Copolymers

Water-dispersed nanoparticles are attractive because of their applications such as biomedicine, bioseparation, and biosensing. A major challenge in biological applications of NPs is how to disperse NPs in aqueous media. Therefore, there have been extensive studies in this direction. For example, polymers, lipids, and their based ligands for native NPs (QDs), Au (tetramethylammonium) for metal NPs, and co-oxidation and malic anhydride for FeO(NPs) have been studied. Here, we report a simple process for the aqueous dispersion of CdSe, CdSe QDs using amphilic diblock copolymer, poly(ethylene-octene-acrylic acid). When the amphiphilic copolymers and NPs were dissolved together in THF, the addition of water caused the spontaneous formation of polymeric micelles, resulting in the uniform and stable micelles and the successful encapsulation and aqueous dispersion of NPs. The structure and size of NC-containing micelles were characterized by TEM, SEM, and DLS.

Fabrication of Mesostructured Polypropylene-Carbon Nanocomposites and Their Application of Electrode in Electrochemical Double Layer Capacitor

The vapor phase of NPs and subsequent polymerization could provide mesostructured polypropylene-carbon nanocomposites with variable polymeric loading. The correlation between polymeric loading amount and electrochemical property was investigated by application of electrode materials in electrochemical-double layer capacitor. The introduced polymeric layer improved the performance of electrode in electrochemical-double layer capacitor due to pseudo-capacity of polypropylene and porous structure. Furthermore, it was shown that the specific capacitance drastically increased as polymeric loading of nanocomposites increased.

Dewetting in block copolymer through solvent annealing

The self-assembly behavior of block copolymer thin films that were induced by solvent annealing was investigated. Cylinder-forming PS-b-PEO was used, and for comparison, the orientation of POE cylinders were controlled to be both parallel and perpendicular to the film surface. Block copolymer films start to dewet below the critical film thickness by "wet" dewetting. Dewetting initially generates the hole pattern, and then island structure with further decreasing the film thickness. Dewetted structures are quantitatively examined and compared with the theoretical prediction.

Patternning of γ-APS on polyimide film via microcontact printing for selective deposition of gold nanoparticles

Pattern gold nanoparticle assembly on polyimide film was obtained by microcontact printing of γ-APS, followed by deposition of gold nanoparticles. Finally, (γ-acrylamidic) of PMO-OLA was spin coated on silicone wafer and thermally imidized. Then, gas plasma etching of water or oxygen was utilized to generate hydrophilic groups on polyimide film. γ-APS ink solution in toluene was prepared in a dry nitrogen-filled glove box and used for spin coating on patterned PDMS stamp, followed by microcontact printing on polyimide film. Then, the samples were immersed into the solution of gold nanoparticles for assembly formation on γ-APS coated area. Finally, patterned gold nanoparticle assembly on polyimide film was characterized by SEM.

Donut-Shaped Crew-Cut Micelle of P1-b-P2VP Diblock Copolymer

Block copolymer self-assemble into a rich variety of morphologies in selective solvent, typically forming spherical micelles, cylindrical micelles, or vesicles. In this work, we report on the formation of donut-shaped Crew-cut micelles of P1-b-P2VP diblock copolymer in THF and ethanol binary solvent mixtures. P1 block aggregate to form a soft core with P2VP block as the corona. Due to the low Tg of core forming P1 block it would allow the micelles to aggregate in response to environmental changes such as the change in selective solvent content. Donut-shaped micelles produced here are stable and exhibit high uniformity in size and shape as the ethanol content increases, which probably originate from the rearrangement of vesicular structures.