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Surface-Engineered Graphene Quantum Dots for Shape Control of Block Copolymer Particles HYUNSEUNG YANG, KANG HEE KU, JAE MAN SHIN, JUNHYUK LEE, CHAN HO PARK, HAN-HEE CHO, KAIST, SE GYU JANG, KIST, BUMJOON KIM, KAIST, KIST COLLABORATION —
Surface-engineered, 10 nm-sized graphene quantum dots (GQDs) are shown to be efficient surfactants for producing poly(styrene-b-4-vinylpyridine) (PS-b-P4VP) particles that feature tunable shapes and internal morphologies. The surface properties of GQDs were modified by grafting different alkyl ligands, such as hexylamine and oleylamine, to generate the surfactant behavior of the GQDs. In stark contrast to the behavior of the unmodified GQDs, hexylamine-grafted GQDs and oleylamine-grafted GQD surfactants were selectively positioned on the PS and P4VP domains, respectively, at the surface of the particles. This positioning effectively tuned the interfacial interaction between two different PS/P4VP domains of the particles and the surrounding water during emulsification and induced a dramatic morphological transition to an unconventional convex lens-shaped particles. Precise and systematic control of interfacial activity of GQD surfactants was also demonstrated by varying the density of the alkyl ligands on the GQDs. The excellent surface tunability of 10 nm-sized GQDs combined with their significant optical and electrical properties highlight their importance as surfactants for producing colloidal particles with novel functions.

Hyunseung Yang
KAIST

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