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Highly Ordered and Highly Aligned Two-Dimensional Binary Superlattice of a SWNT/Cylindrical-Micellar System[1] SUNG-HWAN LIM, HYUNG-SIK JANG, JAE-MIN HA, KAIST, TAE-HWAN KIM, KAERI, PAWEL KWASNIEWSKI, THEYENCHERI NARAYANAN, ESRF, KYEONG SIK JIN, POSTECH, SUNG-MIN CHOI, KAIST — The synthesis of binary nanoparticle superlattice, which may provide new properties through synergetic coupling between different types of nanoparticles, are of great interest for various potential applications as well as its own scientific merit. While exciting progress has been made in the fabrication of binary spherical-nanoparticle superlattices with various symmetries by using an interplay of entropic and enthalpic interactions, systematic experimental studies on the formation of binary 1D nanoparticle superlattices have been very rare. Here, we report a highly ordered intercalated hexagonal binary superlattice of hydrophilically functionalized single-walled carbon nanotubes (p-SWNTs) and surfactant (C12E5) cylindrical micelles. When p-SWNTs (with a diameter slightly larger than that of the C12E5 cylinders) were added to the hexagonally packed C12E5 cylindrical-micellar system, p-SWNTs positioned themselves in such a way that the free-volume entropies for both p-SWNTs and C12E5 cylinders were maximized, thus resulting in the intercalated hexagonal binary superlattice. The binary superlattice can be highly aligned in one direction by an oscillatory shear field and remains aligned after the shear is removed.

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