Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

General Mechanism of Morphology Transition and Spreading Area-dependent Phase Diagram of Block Copolymer Self-assembly at the Air/Water Interface DONG HYUP KIM, SO YOUN KIM, Ulsan Natl Inst of Sci Tech — Block copolymers (BCPs) can be self-assembled forming periodic nanostructures, which have been employed in many applications. While general agreements exist for the phase diagrams of BCP self-assembly in bulk or thin films, a fundamental understanding of BCP structures at the air/water interface still remain elusive. The current study explains morphology transition of BCPs with relative fraction of each block at the air/water interface: block fraction is the only parameter to control the morphology. In this study, we show morphology transitions from spherical to cylindrical and planar structures with neat polystyrene-b-poly(2-vinylpyridine) (PS-b-P2VP) via reducing the spreading area of BCP solution at the air/water interface. For example, PS-b-P2VP in a fixed block fraction known to form only spheres can experience sphere to cylinder or lamellar transitions depending on the spreading area at the air/water interface. Suggesting a new parameter to control the interfacial assembly of BCPs, a complete phase diagram is drawn with two paramters: relative block fraction and spreading area. We also explain the morphology transition with the combinational description of dewetting mechanism and spring effect of hydrophilic block.

Dong Hyup Kim
Ulsan Natl Inst of Sci
Tech

Date submitted: 09 Nov 2016 Electronic form version 1.4