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Block Copolymer Bottlebrushes: New Routes to Ever Smaller Microdomain Sizes MAHESH MAHANTHAPPA, Univ of Minn - Minneapolis, FRANK SPEETJENS, Univ of Wisconsin - Madison — Block copolymer self-assembly presents exciting opportunities for the development of nanotemplates for advanced lithography applications, wherein the microdomain sizes (˜10–100 nm) are governed by the total copolymer degree of polymerization, N. However, this methodology is limited in its smallest achievable length scale, since AB diblock copolymers self–assemble only above a critical N that depends on the magnitude of the effective segmental interaction parameter χ_{AB}. Numerous recent reports have focused on developing "high χ_{AB}" AB diblocks that self–assemble at low values of N. In this talk we explore the ability of non-linear polymer architectures to induce block copolymer ordering at reduced length scales. Thus, we describe the melt and thin-film self-assembly behavior of block copolymer bottlebrushes derived from linking the block junctions of low molecular weight AB diblocks. We quantitatively demonstrate that increasing the bottlebrush backbone degree of polymerization (N_{backbone}) results in a larger reduction in the critical copolymer arm degree of polymerization (N_{arm}) required for self-assembly, thus reducing the length scales at which these materials self-assemble.

Mahesh Mahanthappa
Univ of Minn - Minneapolis

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