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### **Directed self-assembly of performance materials**

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Directed self-assembly (DSA) is a promising strategy for high-volume cost-effective manufacturing at the nanoscale. Over the past decades, manufacturing techniques have been developed with such remarkable efficiency that it is now possible to engineer complex systems of heterogeneous materials at the scale of a few tens of nanometers. Further evolution of these techniques, however, is faced with difficult challenges not only in feasibility of implementation at scales of 10 nm and below, but also in prohibitively high capital equipment costs. Materials that self-assemble, on the other hand, spontaneously form structures at the mesoscale, but the micrometer areas or volumes over which the materials self-assemble with adequate perfection in structure is incommensurate with the macroscopic dimensions of working devices and systems of devices of industrial relevance. Directed Self-Assembly (DSA) refers to the integration of self-assembling materials with traditional manufacturing processes. Here we will discuss DSA of block copolymers to revolutionize sub 10 nm lithography and the manufacture of integrated circuits and storage media, DSA of ex-situ synthesized nanoparticles for applications in nanophotonics, and DSA of liquid crystals for advanced optics.