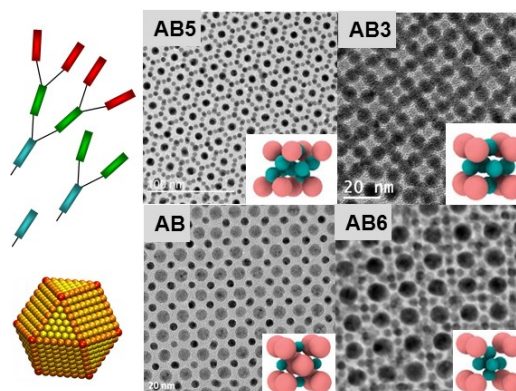


Controlling structural diversity in the self-assembly of nanoparticle superlattices by ligand shell chemistry

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The self-assembly of metallic nanoparticles (NPs) into periodic nanostructures is relevant for the engineering of new materials with tunable and reconfigurable functions, as well as for the subsequent bottom-up fabrication of smart devices. The types of assemblies and the resulting collective properties (optical and magnetic) are also crucially influenced by the surface functionalization (ligand shell). Multi-generation dendritic ligands tethered to the surface of NPs offer highly versatile modular platforms for the development of self-assembled nanomaterials. They allow the formation of NPs assemblies into 2/3D superlattices, with a precise and progressive control of interparticle separations by changing the dendritic generation. Changing the nature of the peripheral dendron substituents also affects some properties, such as wettability or liquid crystalline behavior. For example, dendronized hydrophobic NPs produce long-range single-component superlattices and liquid crystalline phases, and their dual mixing lead to unprecedented $AnBm$ binary superlattices of the Frank-Kasper or Laves types analogous to those found in metal alloys, while dendronized hydrophilic NPs can be dispersed in all kinds of solvents and the interface of emulsions. Finally, they can be used as template for the direct synthesis of a wide variety of NPs, whose shape and size can be tuned by the ligands themselves. All these aspects will be discussed.



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