Abstract Submitted
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Pressure-driven assembly of nanoparticle arrays and nanostructures HONGYOU FAN, Sandia National Laboratories — Due to the size- and shape-dependent properties, nanoparticles have been successfully used as functional building blocks to fabricate multi-dimensional (D) ordered assemblies for applications in nanoelectronic and optic devices. To date, fabrications of ordered nanoparticle assemblies have been performed only at ambient pressure through specific interparticle chemical or physical interactions such as van der Waals interactions, dipole-dipole interaction, chemical reactions, etc. Recently we have discovered that an external pressure can be utilized to engineer nanoparticle assembly and to fabricate new nanoparticle architectures without relying on specific nanoparticle interactions. We show that under a hydrostatic pressure field, the unit cell dimension of a 3D ordered nanoparticle arrays can be manipulated to reversibly shrink, allowing fine-tuning of interparticle separation distance. Moreover, under a uniaxial pressure field, nanoparticles are forced to contact and coalesce, forming 1D nanostructures (nanorods or nanowires) and ordered ultrahigh density arrays. This mechanical compression process opens up a new pathway to the engineering and fabrication of nanoparticle architectures. Sandia National Laboratories is a multi-program laboratory operated by Sandia Corp., a wholly owned subsidiary of Lockheed Martin Corp., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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