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The Internal Structure of Nanoparticle Dimers Linked by DNA FERNANDO VARGAS LARA, Physics Departament, Wesleyan University, Middletown, CT, CHING-JUNG CHENG, OLEG GANG, Center for Functional Nanomaterials, Brookhaven National Laboratory, Upton, NY, FRANCIS W. STARR, Physics Departament, Wesleyan University, Middletown, CT — The self-assembly of inorganic units controlled by the interactions of biological molecules, like DNA, has received attention for the possibility to specify higher-order structure, with potential biological, optical and electronic applications. In biology, self-assembly of complex materials (eg. bone, spider silk) frequently occurs in a stepwise, hierarchical fashion. Here, we consider a first step towards a hierarchical approach for synthetic nanostructures of nanoparticles (NPs) linked by DNA. The most basic unit in this multiscale approach is a dimer of NPs linked by DNA. We use a coarse-grained molecular model to explain experimental measurements of the separation of two DNA-coated NPs connected by linking single-stranded DNA (ssDNA). We show that the dimer separation is primarily controlled by the number of DNA links between NPs. If these links are not constrained to lie along the axis between NPs, the separation is limited by off-axis connections that force the NPs to be closer. We also determine how the number of connections alters the effective persistence length of the ssDNA that connects the dimer. We discuss how these dimers might be used for subsequent assembly at larger scales.

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