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High-yield production of stable colloidal clusters and their use in hierarchical DNA-directed assemblies JAMES MCGINLEY, YIFAN WANG, IAN JENKINS, TALID SINNO, JOHN CROCKER, University of Pennsylvania, CROCKER RESEARCH GROUP COLLABORATION, SINNO RESEARCH GROUP COLLABORATION — Our goal is to produce and purify high yields of stable DNA-coated colloidal clusters by using crystal templates and reprogrammable DNA interactions. First, we incorporate "impurity" particles into a "host" colloidal crystal made up of DNA-coated polymer microspheres, and ensure that the only bonds that are preserved are those between the impurity particles' DNA strands and those of their nearest neighboring host particles. After dispersing the host crystal and making all DNA bonds permanent using a DNA-reactive enzyme, we are left with stable colloidal clusters, each comprised of a single impurity particle surrounded by a number of particles dictated by the host crystal structure. The clusters can be made with Icosahedral, Cuboctahedral, Tetrahedral, Cubic, and Octahedral symmetries, and can then be purified using density gradient fractionation. We will demonstrate that the scalable production of purified, well-oriented and stable DNA-coated colloidal clusters allows for the exploration of hierarchical assemblies with asymmetric building blocks and directional bonding.

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