226d Assembly of Colloidal Particles Via Site-Specific Functionalizations

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Numerous studies have demonstrated the bottom-up assembly of simple and complex structures such as colloidal crystals, close-packed aggregates, and even rings and tetramers. We show the production of simple, localized and nanoscale charge distributions on the surfaces of individual colloidal particles using our technique of "particle lithography". In this technique, parts of the particles are masked off, while polyelectrolytes cover the remaining portions of the particles. The effectiveness of this process is demonstrated by the accurate and reproducible production of colloidal heterodoublets and more complex aggregates composed of oppositely-charged particles. Two key challenges in the processing of complex aggregates are overcoming instabilities of the colloidal suspension and knowing the time required for assembly to occur. Modeling the Brownian motion of the particles gives predictions about the experimental times required for the particle lithography technique. Results are presented for the formation of heterodoublets and complex aggregates, as well as the predicted and experimental assembly times.