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Multivalent Colloids through DNA Patchy Particles[1] YUFENG WANG, YU WANG, Molecular Design Institute and Department of Chemistry, New York University, DANA BREED, The Dow Chemical Company, VINOTHAN MANOHARAN, School of Engineering and Applied Sciences; Department of Physics, Harvard University, LANG FENG, ANDREW HOLLINGSWORTH, Center for Soft Matter Research and Department of Physics, New York University, MARCUS WECK, Molecular Design Institute and Department of Chemistry, New York University, DAVID PINE, Center for Soft Matter Research and Department of Physics, New York University — We demonstrate a general method for creating the colloidal analogs of atoms with multiple valences: colloidal particles with chemically functionalized patches that can form highly directional specific bonds. The valences of these "colloidal atoms" possess all the common symmetries characteristic of hybridized atomic orbitals, including sp, sp^2, sp^3, sp^3d, sp^3d^2, and sp^3d^3. The chemical functionality of the patches is programmable and specific using DNA with single-stranded sticky ends, thereby creating colloidal atoms from which different kinds of "colloidal molecules" can be assembled, including the colloidal analogs of carbon dioxide and tetrahedrally coordinated methane. The bonds between these new colloidal atoms are highly directional and fully reversible with temperature.

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