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Multi-layer microfluidic device to assemble uniform colloidal clusters and double emulsions STEVEN HUDSON, HUA HU, NIST, Gaithersburg, MD 20899 — We fabricated a novel multi-layer PDMS microfluidic device, which integrates a valve and a Coulter counter, to prepare uniform colloidal assemblies and double emulsions. First, bonding techniques, such as oxygen plasma and a chemical bonding method, and their effects on the bonding strength between two PDMS layers were investigated systematically by monitoring fracture pressure. Second, in this multi-layer device, we developed a novel valve that can stop flow in a microchannel with arbitrary width and depth. The efficiency and the response of the valve are reported. The in- line Coulter counter signals actuation of the valve to prepare controlled- size colloidal assemblies or double emulsions that contain a uniform number of particles or droplets. These advanced structures are expected to have broad applications and significant impact in optical materials and biomaterials.

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