

Abstract Submitted
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Magnetically assembled “ring-shaped” colloidal particle structures HUI SON, RANDALL ERB, Duke University, Mechanical Engineering and Material Science, BAPPADITYA SAMANTA, VINCENT ROTELLO, University of Massachusetts, Amherst, Chemistry, BENJAMIN YELLEN, Duke University, Mechanical Engineering and Material Science — We demonstrate a convenient method for assembling ring-shaped colloidal structures by applying uniform magnetic field to a mixture of $2.7\text{-}\mu\text{m}$ paramagnetic beads, $1\text{-}\mu\text{m}$ non-magnetic polystyrene beads, and a fluid dispersion of 10-nm iron oxide nanoparticles (i.e., ferrofluid). The ferrofluid serves as a magnetic contrast medium and induces dipole moments in both the paramagnetic and non-magnetic beads when an external magnetic field is applied. We discovered that for certain volume fractions of ferrofluid, the attractive forces generated between the smaller non-magnetic beads and the larger magnetic beads induce the non-magnetic particles to form a ring structure around the circumference of the paramagnetic beads. This method differs from similar self-assembly techniques in that the ring structures form solely through magnetic force, rather than depending on random motion and patterned bonding.

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