Cite this: *CrystEngComm*, 2012, **14**, 2024

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PAPER

Solvent controlled synthesis of new hematite superstructures with large coercive values†

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Received 28th October 2011, Accepted 18th November 2011
DOI: 10.1039/c1ce06444d

Various morphologies of hematite (α-Fe_2O_3) superstructures such as grape, cube, dumbbell, and microsphere shapes have been reproducibly obtained by a caffeine-assisted environmentally benign one-step hydrothermal synthesis route in the presence of different solvents. The hematite superstructures are formed by self-assembled aggregation of smaller particles of a few nanometres. It is demonstrated that systematic control over the studied experimental conditions (caffeine, solvents, concentration, reaction time, *etc.*) efficiently alters the structural and magnetic properties of the iron oxide nanostructures. In particular, the solvent plays a key role for overall architecture of the oxide particles under different polar conditions. Magnetic hysteresis measurements reveal that the shape of nanostructures has a remarkable effect on the magnetic properties at room temperature. Interestingly, the coercive values are much higher at room temperature than those at lower temperature for the α-Fe_2O_3 superstructures prepared in this work.