

A simple and continuous synthesis of magnetite nanoparticles using supercritical methanol

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Magnetite (Fe₃O₄) nanoparticles were synthesized continuously in supercritical methanol (scMeOH) without using reducing agents at 30 MPa, 400 oC and residence time of 38 s. X-ray diffraction (XRD) analysis revealed that nanoparticles synthesized in scMeOH retained magnetite crystalline structure while those synthesized in supercritical water retained hematite (-Fe₂O₃) crystalline structure. The magnetite nanoparticles were spherical in shape with an average diameter of 21 ± 2 nm, as measured using scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The scMeOH acted both as a reaction medium and a reducing agent. The reduction power of scMeOH was attributed to the dissociation of hydroxide ions from methanol molecules and involvement of the hydroxide ion in the reduction reaction.