

Accepted Manuscript

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PII: S0167-577X(18)30467-1

DOI: <https://doi.org/10.1016/j.matlet.2018.03.103>

Reference: MLBLUE 24064

To appear in: *Materials Letters*

Received Date: 12 February 2018

Revised Date: 15 March 2018

Accepted Date: 17 March 2018



Please cite this article as: S. Liu, F. Li, The synthesis of mono-dispersed ϵ -Fe₃N nanoparticles by gas phase reaction with controlled annealing conditions, *Materials Letters* (2018), doi: <https://doi.org/10.1016/j.matlet.2018.03.103>

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The synthesis of mono-dispersed ϵ -Fe₃N nanoparticles by gas phase reaction with controlled annealing conditions

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Abstract

This paper reported a gas phase reaction to synthesize ϵ -Fe₃N nanoparticles with controlled annealing conditions. Vaporized iron pentacarbonyl (Fe(CO)₅) was used as the iron source, and ammonia (NH₃) was used as the nitrogen source. In three parallel experiments, the annealing time of the nanoparticles was controlled. The particle morphologies and lattice parameters of the as-synthesized particles were characterized by TEM, and the crystal structure and crystallization level were determined by XRD. The magnetic properties were measured by VSM. The experimental results showed that enhanced crystallization and magnetization were obtained on the nanoparticles with longer annealing time.

Keywords: X-ray techniques; Crystal growth; Fe₃N; Nanoparticles; Magnetic materials.

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