Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Large scale synthesis and formation mechanism of highly magnetic and stable iron nitride (ε-Fe_3N) nanoparticles

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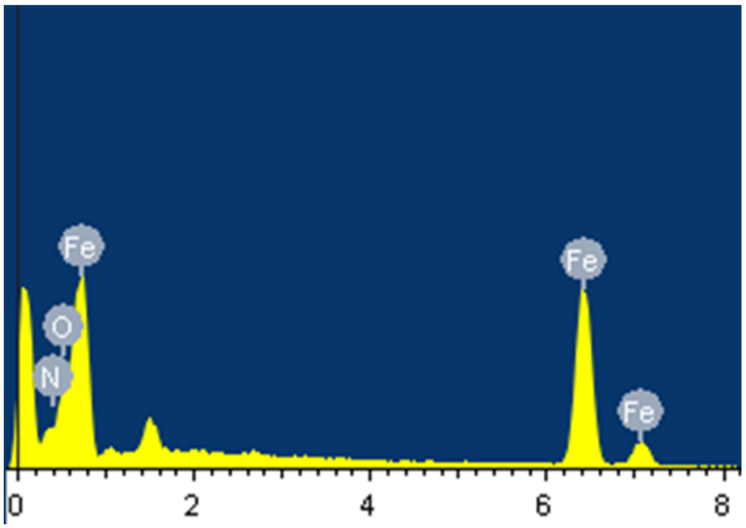
1. Compositional analysis

The obtained energy dispersive X-ray (EDX) graph of the synthesized ε-Fe_3N nanoparticles (FNNPs) is shown in Fig. S1.



Element	Atomic%
Fe	72.56
N	24.03
o	3.41
Total	100.00

Fig. S1 EDX spectrum and atomic ratio of ε-Fe_3N nanoparticles

The presence of Fe and N is confirmed in the synthesized ε-Fe_3N nanoparticles. However, some traces of oxygen are also observed in the samples, which could be due to the

adsorbed oxygen on surface of FNNPs. Further, the atomic ratio of the elements presence in the composition is also obtained from the EDX spectrum that confirmed the Fe to N atomic ratio as in the ε-Fe_3N phase. The non-indexed peak at around 1.5 keV is corresponding to the aluminium (Al) as the aluminium foil used as the substrate for the sample preparation towards the FESEM/EDX analysis.

2. Morphology analysis

The FESEM micrographs of zero valent iron nanoparticles (ZVINPs), ε-Fe_3N nanoparticles are shown in Figs. S2(a) and (b) and Figs. S2(c) and (d), respectively.

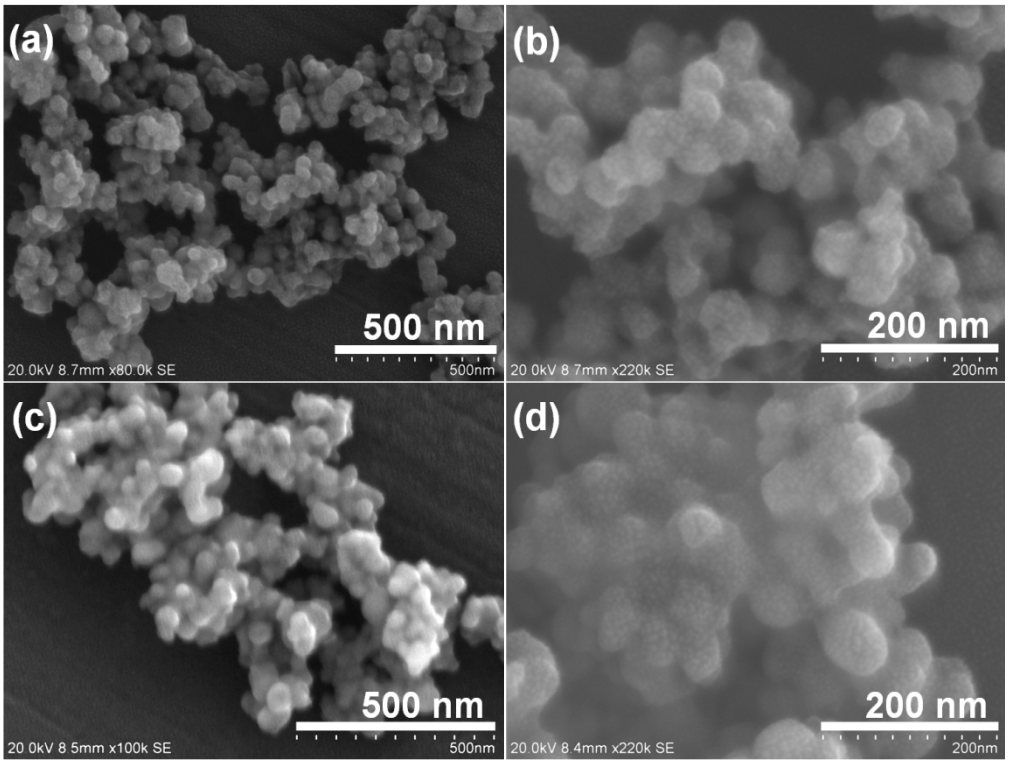


Fig. S2 FESEM micrographs of **(a)-(b)** ZVINPs and **(c)-(d)** ε-Fe_3N nanoparticles

These micrographs clearly reveal the aggregated and spherical shaped morphology for the as-synthesized nanoparticles. Further, an increase in the particle size for the FNNPs is apparent after the nitridation process.