Synthesis FeCo nanoparticles by $NaBH_4$ reduction in oleylamine

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FeCo alloy nanoparticles are of great interest because of their wide applications on catalysis, biomedicine, magnetic resonance imaging (MRI), and data storage. Reducing inorganic salts of iron and cobalt with sodium borohydride ($NaBH_4$) in aqueous solution is a popular synthesis method due to its low cost and easy operation. However, there are several limitations, such as particle agglomeration[1], impurity phases (Fe_xB[2] and Co_xB[3]) and amorphous product[1]. To overcome these limitations, we reduced iron and cobalt organic precursors with $NaBH_4$ in an organic solvent. Briefly, iron(III) acetylacetonates ($Fe(acac)_3$), cobalt(II) acetylacetonates ($Co(acac)_2$) and $NaBH_4$ were introduced into oleylamine under a gas mixture of 95% N_2 + 5% H_2 at room temperature. The mixture was then heated to 300 ^oC for 10 min. After reaction, the product was separated and washed for characterization. Fig. 1 shows the TEM image of FeCo nanoparticles with good dispersion and size around 15 nm. X-ray diffraction peaks in Fig. 2 are correctly indexed to body centered cubic (bcc) structure of FeCo alloy. A magnetic hysteresis loop in Fig. 3 shows that the synthesized FeCo nanoparticles have high magnetization (138 emu/g) and low coercivity (192 Oe). This method improves the quality of FeCo nanoparticles synthesized from $NaBH_4$ reduction.

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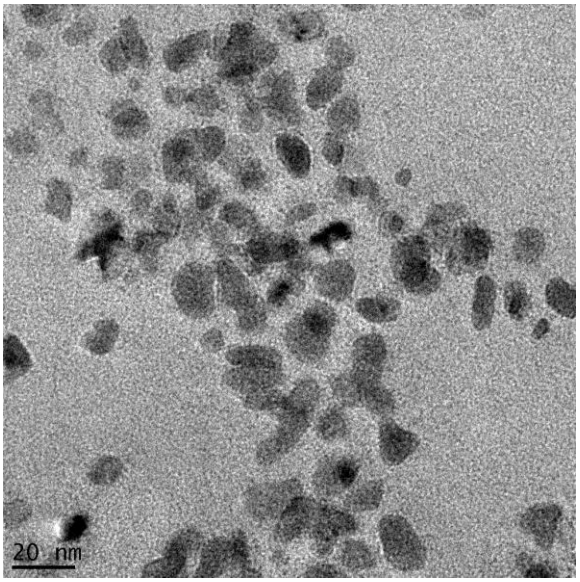


Fig. 1 TEM image of FeCo nanoparticles

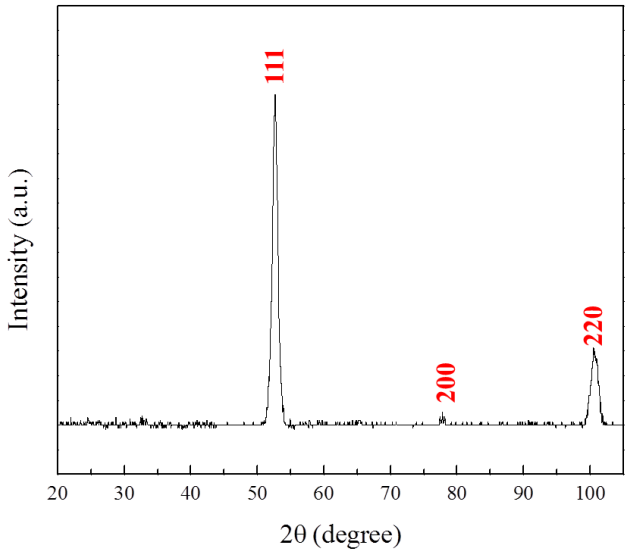


Fig. 2 XRD patterns of FeCo nanoparticles

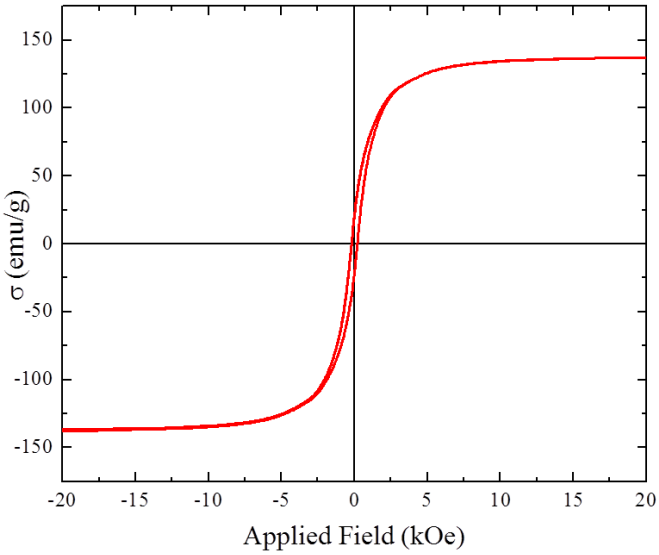


Fig. 3 Magnetic hysteresis loop of FeCo nanoparticles