Synthesis and characterization of hematite nanoparticles using ultrasonic sonochemistry method

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Abstrak

This paper presents an investigation on the method for synthesizing hematite nanoparticle using ultrasonic sonochemistry. The effect of various bases with different basicity strengths, i.e. NaOH, NH4OH, and butylamine, as well as sintering treatment on the purity and crystallinity of hematite nanoparticles was studied. In this work, the as-synthesized hematite nanoparticles were characterized using FTIR, XRD, and HR-TEM analyses. The results showed that the formation of hematite crystal can undergo two possible reaction pathways depending on the basicity of the solution. When strong bases like NaOH and butylamine were used, iron(III) ion could react with water to form iron complexes, which further grow into rod-like magnetite nanocrystals as the major product. However, direct reaction of iron(III) ion with hydroxide ion to form hematite was observed when a weak base like NH4OH was used. Furthermore, it was also found that most of the polymorphous iron oxide precursors can be transformed into hematite crystals via high-temperature sintering.