

Easy Synthesis and Magnetic Properties of Iron Oxide Nanoparticles

Kyoungja Woo,^{*,†} Jangwon Hong,[†] Sungmoon Choi,[†] Hae-Weon Lee,[†]
Jae-Pyoung Ahn,[†] Chul Sung Kim,[‡] and Sang Won Lee[‡]

*Nano-Materials Research Center, Korea Institute of Science and Technology,
P.O. Box 131, Cheongryang, Seoul 130-650, Korea, and Department of Physics,
Kookmin University, Seoul 136-702, Korea*

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Easy preparation of iron oxide nanoparticles [5- and 11-nm maghemite (γ -Fe₂O₃) and 19-nm magnetite (Fe₃O₄)] by thermal decomposition of Fe(CO)₅ in the presence of residual oxygen of the system and by consecutive aeration were investigated by TEM/HRTEM, XRD, and Mössbauer spectroscopy. Also, the magnetic properties of the nanoparticles were studied by SQUID magnetometer and optical microscopy. It was suggested that the intermediate iron oxide nanoparticles (before aeration) were formed by the competing processes of oxidation and crystal growth after decomposition of Fe(CO)₅. At room temperature, the aerated 5-nm particles were superparamagnetic without interaction among the particles, whereas the 19-nm particles were ferrimagnetic. The 11-nm iron oxide nanoparticles were superparamagnetic with some interactions among the particles.