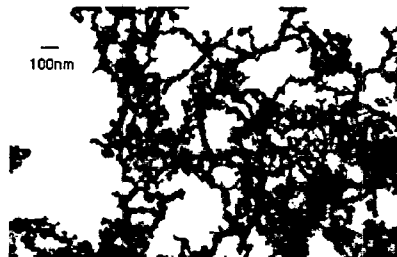


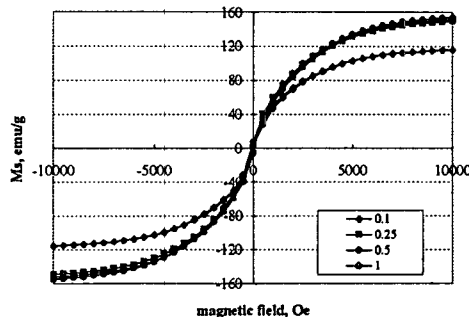
나노스케일의 철 분말 제조 및 특성 연구
Preparation and Properties of nanoscale Iron metal
by chemical reduction with sodium borohydride

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Although the chemical reduction of metals(Fe, Co and Ni) with sodium borohydride are well known, most researchers have obtained metal borides. Little confirming evidence has been presented that the obtained particles were elemental metal, metal borides or a mixture of them. Even where the nature of the particles was confirmed, their magnetic properties exhibited large variations and discrepancies depending on the preparation conditions. We have obtained authentic nanoscale iron particles by varying the mole ratio of borohydride to iron in the range of 0.1 to 1.0. The blocking temperature of the iron particles is 160K and the average diameter is 13 nm. The saturation magnetization of the iron particles is increased by almost three fold to 156 emu/g after annealing them at 500 °C for 1 h, compared to 57 emu/g before annealing. To improve the stability of the iron particles in air, attempts were made to coat them with SiO₂ or carbon. The SiO₂ coated particles exhibited a lower rate of oxidation than the uncoated particles, but still did gradually oxidize. Carbon coating has same effect on the stability of the iron particles as that of annealing at 500 °C for 1 hour. Both treatments result in significant improvement in stability of the particles toward air oxidation.



TEM of annealed iron particles obtained from B/Fe ratio=0.5 at 500 °C for 1 hour.



Ms of heat treated iron powder at various ratio of B/Fe