

역미셀 방법을 이용한 금이 코팅된 철 나노입자의 제조와
이를 이용한 마이크로 기어 제작

Synthesis of Gold-Coated Iron Nanoparticles by Two-Step Reverse
Micelle Method and Their Application to Micro-Gear Parts

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Recently, nano-sized metal particles have attracted much attention due to their wide potential applications. One of these applications is extremely strong and wear-resistant mechanical parts of micro or millimeter size. In this work, Au-coated Fe (Fe@Au) nanoparticles were synthesized for micro-gear application through the reverse micelle method. In this method, reactive microemulsion consists of two phases; one is water droplets which are aqueous reverse micelles containing metal salts and the other oil pool which was octane in this work. Cetyl-trimethyl-ammonium bromide (CTAB) and 1-butanol were added to the microemulsion as surfactant and co-surfactant, respectively. Nano-sized Fe@Au nanoparticles were successfully synthesized by reduction of the metal salt inside the reverse micelles. Their structural features were characterized by means of X-ray diffraction (XRD), transmission electron microscopy (TEM), scanning transmission electron microscopy (STEM), ultraviolet-visible spectroscopy (UV-vis), and differential scanning calorimeter (DSC). Finally, micro-gears were fabricated by settling down these nanoparticles on micro-gear-shaped polymer molds at the end of the above process.