

DCアーク放電によるグラファイト外包金ナノ微粒子の作製と

RFプラズマによる表面機能化

Preparation of Graphite-Encapsulated Gold Nanoparticles by DC Arc Discharge and Their Surface Functionalization by RF Plasma

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We have developed a plasma processing technology to functionalize the surface properties of nano-structured materials for biomedical applications. So far, we succeeded in fabrication of graphite-encapsulated magnetic(Fe, Ni, Co, Sm, Nd) nanoparticles with a diameter of 10~70 nm. We also demonstrated amino group introduction onto the surface of graphite-encapsulated magnetic nanoparticles using low-pressure Ar/NH₃ plasma treatments. To apply them to various medical fields, the nanoparticles should be functionalized for improving biocompatibility and dispersion property. For this purpose, we have carried out the fabrication of graphite-encapsulated gold nanoparticles by the DC arc discharge. In detail, this study was performed by three sequence steps. Firstly, arc discharge method was employed to fabricate the nanoparticles. Secondly, the particles were treated by a RF(radio frequency) inductively-coupled plasma device using Ar and NH₃ plasma to introduce amino functional groups onto their surface. Among various functional groups for bioapplication, the introduction of amino groups composed of primary amines to the particles surface achieves enhanced wettability and improves its adhesion. At last, after

plasma treatment, the biomolecules is immobilized to the particles to test the role of the nitrogen-containing group as a linker to the biomolecules. XRD, XPS, HR-TEM and EDS elemental mapping were used to characterize and analyze the nanoparticles.

As the results, the graphite layers encapsulated gold particles were successfully modified by Ar and NH₃ plasma processing and characterized well. Fig.1 shows that the core-shell structure was well founded using the method mentioned above.

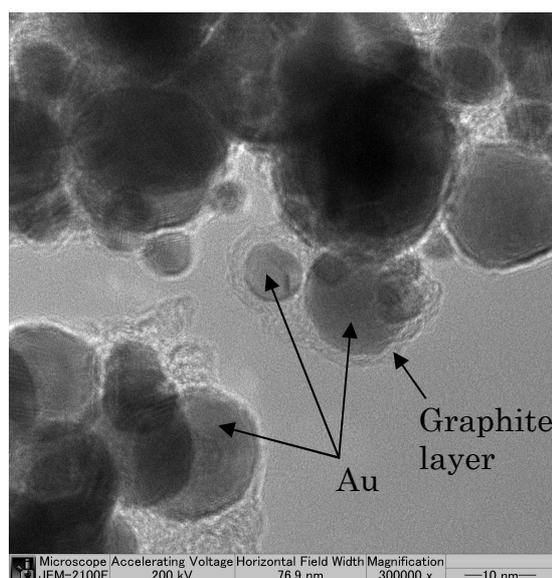


Fig.1 HR-TEM image of graphite-encapsulated gold nanoparticles.