SONOCHEMICAL PREPARATION OF GOLD/IRON OXIDE COMPOSITE MAGNETIC NANOPIR CLES

AND SELECTIVE MAGNETIC SEPARATION OF BIOMOLECULES

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Abstract:

We have successfully prepared Au nanoparticles by the sonochemically reducing Au(III) ions and immobilized them on the surface of magnetic γ-Fe₂O₃ nanoparticles. Au particles with average diameter of about 10 nm were homogeneously dispersed on the surface of γ-Fe₂O₃ (average diameter : 26 nm) without aggregation. The number of the Au nanoparticles supported on each γ-Fe₂O₃ particle was controlled by changing the relative amounts of Au(III) ions and γ-Fe₂O₃ particles.

Au nanoparticles are known to selectively adsorb the molecules having sulfur.¹ Aiming at the uses for magnetic carriers of specific biomolecules, we employed prepared composite nanoparticles for selective separation of biomolecules and estimated their adsorption properties. The composite nanoparticles exhibited a high affinity with glutathione, a tripeptide with mercapto group, so that separation and manipulation of glutathione in aqueous solutions could be performed by applying an external magnetic field.² Magnetic separations of amino acids were also investigated. Composite nanoparticles were mixed with amino acid standard solution containing 17 kinds of amino acids and their magnetic separations were carried out by applying an external magnetic field. It was found that adsorption amounts of methionine and cystine, containing internal sulfur were larger than other amino acids. The adsorbed amounts of sulfur containing amino acids increased with relative amount of Au in the composite nanoparticles.

These results suggest that the present composite nanoparticles can be utilized as a magnetic carrier for drug delivery system or separation of specific biomolecules, such as SNPs (single nucleotide polymorphisms).
Keywords: Sonochemistry; Composite Nanoparticles; Magnetic Separation


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IMMOBILIZATION OF GOLD NANOPARTICLES ON THE SURFACE OF MAGNETIC IRON OXIDE PARTICLES AND THEIR APPLICATION FOR SELECTIVE MAGNETIC SEPARATION OF BIOMOLECULES HAVING SULFUR

We prepared Au/γ-Fe₂O₃ composite nanoparticles by sonochemically reducing Au(III) ions employing no stabilizer in the aqueous solution to form stable Au nanoparticles and allowing them to attach onto the surface of γ-Fe₂O₃ particles. Size of the formed Au nanoparticle depended on the initial concentration of Au(III) ions. The number of the Au nanoparticles, supported on each γ-Fe₂O₃ particle was controlled by changing the relative amounts of Au(III) ions and γ-Fe₂O₃ particles. The composite nanoparticles exhibited a high affinity with glutathione, a tripeptide with mercapto group so that separation and manipulation of glutathione in aqueous solutions could be performed by application of external magnetic field. Because the surfaces of the Au nanoparticles were not shielded by any stabilizers, or naked, σονοχημιαλλαψηεπαρεδΛυ/γ-Fe₂O₃ composite nanoparticles seemed to show stronger affinity to the glutathione than those by the radiochemical method.