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Preparation of Radioactive and Nanometric $Cu_xFe_{1-x}OFe_2O_3$ for Treatment of Tumor

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I Introduction

The ferrofluid exhibits superparamagnetic property due to the magnetic nanoparticles of single domain[1]. Therefore, the fluids behave as an ferromagnetic material under external field[2]. The ^{67}copper is effective in tumor therapy because it is a β-emitting radionuclide with the energy of 0.577MeV and has half time of 61.83h. Also, ^{67}Cu radiates the γ-line of 150keV close to the energy of ^{99m}Tc which is often used in tumor diagnosis. Since the radiation is imaged easily with γ-camera[3], the magnetic fluids can be gathered to the treatment site with the radiograph.

II Experimental

The magnetic fluid was prepared by a two-step method. In the first step, the mixed solution of $CuCl_2$, $FeCl_2$ and $FeCl_3$ was heated to 80℃ with continuous stirring, then alkali was excessively added. The precipitate was coated with decanoic acid. In the second step, the precipitate was washed with acetone and water. Then, the precipitates were coated with nonanoic acid.

III Results

The nanometric $Cu_xFe_{1-x}OFe_2O_3$ magnetic particles were prepared by the two-step chemical coprecipitation method, in which the x value varied from 0.1 to 0.4. The magnetization of the magnetic particles decreased with increasing contents of diamagnetic copper element. The magnetic crystal structure of the compound has changed after incorporating the copper element into the magnetite. In the case using tetramethylammonium hydroxide as dispersant in the second coating, the dispersibility of the magnetic fluids were much better than that in the case using ammonia water. The copper element could be removed with excess ammonia water, due to the chelate component $[Cu(NH_3)_4]^{2+}$ easily dissolved in water.

References

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