

7th World Nano Conference

June 20-21, 2016 Cape Town, South Africa

Preparation of Au/silica/cellulose nanoparticle colloid solution and its use in X-ray imaging process

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X-ray imaging of mice using a colloid solution of Au nanoparticles that were coated with silica and subsequently surface-modified with carboxymethylcellulose (CMC) (Au/SiO₂/CMC) was performed in this work. The silica-coating for Au nanoparticles and the amination for silica-coated particles were simultaneously performed in the presence of the Au nanoparticles with a size of 17.9 nm, which were prepared by reducing Au ions (III) with sodium citrate in water at 80°C and by surface-modifying the Au nanoparticles with (3-aminopropyl)-trimethoxysilane, by a sol-gel process using tetraethylorthosilicate, (3-aminopropyl)-triethoxysilane, water and sodium hydroxide (Au/SiO₂-NH₂). The surface modification of Au/SiO₂-NH₂ particles with CMC was performed by simply adding CMC with carboxyl groups that react with an amino group to the Au/SiO₂-NH₂ particle colloid solution. The as-prepared the Au/SiO₂/CMC particle colloid solution was concentrated by centrifugation for measurements using computed tomography (CT). Most particles contained a single core of the Au nanoparticles. Their particle size was 67.4±5.4 nm. A CT value of the Au/SiO₂/CMC particle colloid solution with a Au concentration of 0.043 M was as high as 344±12 Hounsfield units (HU). This value corresponded to 8.0×10³ HU/M with respect to the Au concentration, which was larger than that of Iopamiron 300, a commercial X-ray contrast agent. Mouse tissues were imaged following injection of the Au/SiO₂/CMC particle colloid solution.

Biography

Yoshio Kobayashi received his BS (1988), MS (1990), and PhD (1993) degrees from Tohoku University. He worked as a Research Associate at Tohoku University (1993-1997), as a Postdoctoral Researcher at Colorado State University (1997-1998), as a Postdoctoral Researcher at Kansas State University (1998-1999), as a Visiting Researcher at Universidade de Vigo (1999-2001), as a Research Associate at Tohoku University (2001-2002), and as an Associate Professor at Tohoku University (2002-2006). He is a Professor of Ibaraki University, and has published more than 150 papers in reputed journals.

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