Fabrication of sub-10nm gold nanoparticles on Si substrate using biotemplate method

T. Isoda, I. Yamashita\textsuperscript{a}, S. Samukawa\textsuperscript{b}, K. M. Itoh

\textit{Keio University, Kanagawa 223-8522, Japan}

\textit{\textsuperscript{a} Nara Institute of Science and Technology, Nara 630-0192, Japan}

\textit{\textsuperscript{a} Tohoku University, Miyagi 980-0812, Japan}

taiga405@z7.keio.jp

We fabricated sub-10nm gold nanoparticles on a Si substrate using ferritin molecules (Fig. 1). Ferritin is a spherical shell protein that holds 6 nm diameter iron core. Fabrication methods are illustrated in Fig. 2. The Si(111) substrate is spin-coated with ferritins [1]. Then, the substrate is annealed in O\textsubscript{2} flow to form SiO\textsubscript{2} film and remove the ferritin protein shells. In this process, the ferritin iron cores act as the mask against the oxidation, so that the substrate surface is divided into thin and thick SiO\textsubscript{2} parts. The iron cores are removed by HCl solution, and the thin SiO\textsubscript{2} part is removed by annealing in vacuum. Finally, gold is deposited on this template in vacuum. Gold is selectively nucleated in the holes, where the Si substrate is exposed, so gold nanoparticles of sub-10nm diameter are formed. These gold nanoparticles will be used as a catalyst for semiconductor nanowires that have extremely thin diameter.

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