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Synthesis and nano-placement of nanoparticle using cage-shaped protein S. KUMAGAI, S. YOSHII, K. YAMADA, K. NISHIO, N. MATSUKAWA, ATRL, Matsushita Electric Industrial, K. IWAHORI, CREST, JST, I. YAMASHITA, ATRL, Matsushita Electric Industrial, CREST, JST, NAIST — Nanoparticles (NPs) have been attracting considerable attention and the placement of a single NP at will is fundamental technique for nanodevices. We artificially synthesized a variety of uniform NPs (ϕ6nm) within the cage-shaped protein, apoferritin and studied the placement of ferritin (apoferritin with NP core, ϕ12nm). We numerically analyzed the interaction between negatively charged ferritin and positively charged nano-disk on the negatively charged SiO2 surface, which can be realized at neutral pH. The calculated free energy potential profile derived from electrostatic interaction, osmotic pressure and van der Waals force showed that a ϕ15nm positively charged disk could attract a single ferritin molecule in the solution with the Debye length of 14nm. Using the conditions, a single ferritin molecule was placed successfully on the every disk arranged quadrilaterally with 100nm interval. Heat treatment under O2 gas removed protein shell selectively and left NP array. The electrostatic interaction with long range effect has been thought unsuitable for the nano-placement, but it was clearly demonstrated that the electrostatic interaction achieves handling of molecules with nanometric resolution. This study is partially supported by MEXT, Japan.

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