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Viability preserved capture of microorganism by plasma functionalized carbon-encapsulated iron nanoparticles[1] ANCHU VISWAN, GSST, Shizuoka University, Hamamatsu, Japan, KUNIAKI SUGIURA, Graduate School of Engineering, Shizuoka University, Hamamatsu, Japan, MASAAKI NAGATSU, GSST and Graduate School of Engineering, Shizuoka University, Hamamatsu, Japan
— Carbon-encapsulated iron nanoparticles (Fe@C NPs) were synthesized by DC arc discharge method. Carbon encapsulation makes the particles hydrophobic, however for most of the biomedical applications they need to be hydrophilic. To attain this, the particles were amino functionalized by RF plasma. Effect of gas mixture ratio (Ar/NH_3), pretreatment, post-treatment times and RF power were optimized. By varying the RF plasma conditions, the amino group population on the surface of Fe@C NPs were increased. With conventional chemical method the amino group population on particles, synthesized in different conditions was found to be ranging from 3-7 $\times$ 10^4 per particle. Bioconjugation efficiency of the nanoparticles was examined by biotin-avidin system, which can be simulated for antigen-antibody reactions. Results from the UV absorption and fluorescence spectroscopy shows increment in bioconjugation efficiency, with the increase of amino group population on the nanoparticles. After confirming the bioconjugation efficiency, the amino functionalized Fe@C NPs were modified with antibodies for targeting specific microorganisms. Our aim is to capture the microbes in viable and concentrated form even from less populated samples, with lesser time compared to the presently available methods.

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