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EVALUATION OF THERMO RESPONSIVE MAGNETIC NANO-PARTICLES FOR HIGH- T_c SQUID BIO APPLICATION

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Immunoassay is commonly used for detection of a specific antigen that is detected by using an antibody, which connects with the specific antigen. Conventional detection methods are based on labeling with fluorescent dyes or enzymes. Although its sensitivity is the order of 10 pg, more sensitive methods are desired for earlier diagnosis. Recently, immunoassay using a high sensitive SQUID and magnetic nano-particles as labeling has been proposed. In this method, mostly a few particles are labeled on an antibody. If it is possible to give much more magnetic particles to the antibody, sensitivity must notably increase. We propose the use of thermo responsive magnetic nano-particles, which can agglutinate and disperse by themselves associated with temperature. Here we used Fe₃O₄ particles with core diameter of 50 nm, outer dimension of 90 nm and critical temperature of 32 degrees centigrade. By detailed study on the particles using an analyzer for a particle diameter distribution in liquid, nanotracs TX-150, it was found that the diameter increased with temperature above 25 degrees, and became 400 nm at 30.5 degrees. The diameter at 35 degrees couldn't be measured correctly. It is supposed that above 31 degrees aggregated particles should be so large that most particles had went down. Thus temperature at around 30 degrees should be optimal for labeling antibody with this particle. The aggregated particle with diameter of 400 nm corresponds to at most 48 particles. It suggests that the magnetic signal from the antibody labeled with these particles may be significantly improved.