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Shaken Not Stirred: Magnetic Viruses for Biomagnetic Sensing

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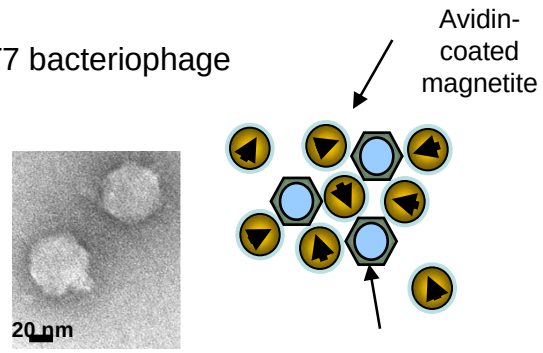
Micron and nanosized magnetic particles coated with biochemical surfactants have emerged recently as an important component for enabling many biological and medical applications. Among these biomagnetic sensors have received a lot of attention lately, due to their potential advantages of simplicity and rapidity. The most common approach to biomagnetic sensors utilizes magnetic beads, whose magnetic moment is detected by a magnetic field sensor, such as a giant magnetoresistive spin valve. In contrast we demonstrated a new substrate-free approach to biomagnetic sensing which uses the magnetic ac-susceptibility of ferromagnetic nanoparticles suspended in a liquid for the signal transduction. For the application of this ac-susceptibility sensing scheme we are currently developing “magnetic viruses”, which give us a well-defined mono-disperse size distribution of the ferromagnetic particles together with an easy possibility to engineer the desired biological recognition functionality. We create the “magnetic viruses” by utilizing native protein capsid shells derived in high yield from T7 bacteriophage viruses. Using these capsids as templates for growing magnetic nanoparticles in their inside has the advantage that the capsids retain their original chemical recognition properties, which can be tailored via phage display libraries to display virtually any affinity reagent specific to any target. This fabrication of “magnetic viruses” is in contrast to the traditional fabrication of bio-functionalized magnetic nanoparticles, where the particles are typically functionalized after the preparation of the magnetic particles. This work was supported by Department of Energy, Basic Energy Science under contract W-31-109-ENG-38 and DARPA under contract 8C67400.



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