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Static and Alternating Field Magnetic Capture and Heating of Iron Oxide Nanoparticles in Simulated Blood Vessels[1] JOANNE HAEUN LEE, The City College of New York, CUNY, RHYTHM R. SHAH, CHRISTOPHER S. BRAZEL, The University of Alabama — Targeted drug delivery and localized hyperthermia are being studied as alternatives to conventional cancer treatments, which can affect the whole body and indiscriminately kill healthy cells. Magnetic nanoparticles (MNPs) have potential as drug carriers that can be captured and trigger hyperthermia at the site of the tumor by applying an external magnetic field. This study focuses on comparing the capture efficiency of the magnetic field applied by a static magnet to an alternating current coil. The effect of particle size, degree of dispersion, and the frequency of the AC field on capture and heating were studied using 3 different dispersions: 16 nm maghemite in water, 50 nm maghemite in dopamine, and 20-30 nm magnetite in dimercaptosuccinic acid. A 480G static field captured more MNPs than a similar 480G AC field at either 194 or 428 kHz; however, the AC field also allowed heating. The MNPs in water had a lower capture and heating efficiency than the larger, dopamine-coated MNPs. This finding was supported by dynamic light scattering data showing the particle size distribution and vibrating sample magnetometry data showing that the larger MNPs in the dopamine solution have a higher field of coercivity, exhibit ferrimagnetism and allow for better capture while smaller (16 nm) MNPs exhibit superparamagnetism. The dispersions that captured the best also heated the best.

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Amy Lang
The University of Alabama

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