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Thin film metallic sensors in an alternating magnetic field for magnetic nanoparticle hyperthermia cancer therapy Z. A. HUSSEIN, Z. BOEKELHEIDE, Lafayette College — In magnetic nanoparticle hyperthermia in an alternating magnetic field for cancer therapy, it is important to monitor the temperature in situ. This can be done optically or electrically, but electronic measurements can be problematic because conducting parts heat up in a changing magnetic field. Microfabricated thin film sensors may be advantageous because eddy current heating is a function of size, and are promising for further miniaturization of sensors and fabrication of arrays of sensors. Thin films could also be used for in situ magnetic field sensors or for strain sensors. For a proof of concept, we fabricated a metallic thin film resistive thermometer by photolithographically patterning a 500Å Au/100Å Cr thin film on a glass substrate. Measurements were taken in a solenoidal coil supplying 0.04 T (rms) at 235 kHz with the sensor parallel and perpendicular to the magnetic field. In the parallel orientation, the resistive thermometer mirrored the background heating from the coil, while in the perpendicular orientation self-heating was observed due to eddy current heating of the conducting elements by Faradays law. This suggests that metallic thin film sensors can be used in an alternating magnetic field, parallel to the field, with no significant self-heating.

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