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Redesign of an AC Magnetic Susceptometer for Measurements in Smaller Samples[1] ANDRES VARGAS, RYAN FUKUDA, SMITHA SUNNY, PEI-CHUN HO, Department of Physics, California State University, Fresno — A new AC magnetic susceptometer was created for the purpose of measuring the magnetic properties of smaller samples, such as nanoparticles that are currently being synthesized in our lab. The susceptometer consists of a primary coil, a secondary coil, and a sample holder. The primary coil is the outer component of the susceptometer, which provides a magnetic field when current is applied due to Ampere's Law. Inside of the primary coil lies the secondary coil, which has two oppositely wound solenoids; they are oppositely wound to reduce background signal. The sample holder lies inside of the secondary coil with the sample. All of these go inside of a beryllium copper casing for protection. We tested the susceptometer by looking for the ferromagnetic phase transition of an 11 mg Gd sample. A $\sim 100\mu$A AC current was applied to the primary coil, which created a magnetic field that polarized the magnetic moments in the sample. This induced a voltage on the secondary coil, which is proportional to the magnetic susceptibility. We measured the temperature dependency of the induced voltage from 10 K to 300 K. The results showed a sharp increase in the induced voltage around 293K, which agrees with the known ferromagnetic transition of Gd.

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