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Development of Nonmagnetic Materials for Spin-Dependent Fifth Force Searches[1] LAWRENCE DENNIS, Cornell College, RAKSHYA KHATIWADA, W.M. SNOW, Indiana University — Theories beyond the Standard Model predict the possible existence of a spin-dependent force between polarized and unpolarized masses proportional to $\hat{S} \cdot \hat{r}$, called the "monopole-dipole" force in the literature [1]. Experiments that introduce a nonmagnetic mass close to and far from an ensemble of polarized nuclei and search for NMR frequency shift have set the best limits on neutron monopole-dipole interaction with matter in the range of 1 cm to several microns [2]. We are investigating various means of reducing systematic error in experiments of this type stemming from the finite magnetic susceptibility of the moving mass. We have designed a teflon container with a thin teflon membrane which can move liquid gallium in an inert atmosphere and with the slightly acidic environment required to suppress oxidation which causes gallium to stick to surfaces. We have also hot-pressed mixtures of two materials with high nucleon densities and opposite signs of magnetic susceptibility (tungsten and bismuth powders) in proportions chosen to give a magnetic susceptibility near zero at room temperature. We will present the results of these investigations.

[1] J. Moody and F. Wilczek, Phys. Rev. D (1984).
[2] P. Chu et al, Phys. Rev. D 87, 011105(R) (2013).

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