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Separation of H_2, HD and D_2 using Low Temperature Gas Chromatography[1] C. STEVEN WHISNANT, TRAVIS KELLEY, RYAN BURKE, PATRICK HANSEN, James Madison University — The frozen spin HD target developed for the study of photonuclear physics by the LEGS collaboration at Brookhaven National Laboratory (and now moved to JLab) requires high purity HD gas to produce targets with spin relaxation times on the order of months. Since this purity is not available commercially, the gas is distilled at low temperature to reduce the residual H_2 and D_2 contamination. Quantifying the remaining amount of these contaminants is important for preparing a target that obtains the desired polarization and spin relaxation time. To measure the relative concentrations of H_2 and D_2, a gas chromatography system has been developed that separates the isotopes of hydrogen. The system uses a 50 meter porous-layer open-tabular (PLOT) $5\mathring{A}$ carbon molsieve column with an inner diameter of 0.53 mm held at temperatures near $150K$. The carrier gas is neon. The signal is produced by measuring differences in thermal conductivity between hydrogen and neon. Under these conditions, not only are H_2 and D_2 separated from HD, but o-H_2 and p-H_2 are also well separated from one another. The resulting chromatograms are fit to extract areas and corrected for isotopic differences in thermal conductivity to produce relative concentrations. The analysis of several gas samples will be presented and the status of the method discussed.

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