

## Development of a Sensitive Detection System for the Measurement of Trace Amounts of He<sup>4</sup> in Deuterium or Hydrogen

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Many LENR systems seem to generate He<sup>4</sup> from deuterium but there are few systems that can detect trace amounts of He<sup>4</sup> in the presence of D<sub>2</sub>. Most commercial magnetic sector systems are large and expensive and while they have excellent  $\Delta m/m$  resolution, they still require a getter system to achieve ppb sensitivity. We have developed a lower cost and compact system that allows us to measure He<sup>4</sup> down to sub 100 ppb levels in D<sub>2</sub>. This system utilizes a column of activated carbon at LN<sub>2</sub> temperature that effectively absorbs everything but Helium. Post absorption, the system uses a MKS Microvision and a SRS 100 RGA to check for helium purity. The helium eluted from the column is quantified by a small magnetic sector mass spectrometer tuned to mass 4. A typical sample size required to achieve low ppb sensitivity to He<sup>4</sup> is 50 cc at 50 torr. Calibrations have been done with air, He<sup>4</sup> in D<sub>2</sub> at various concentrations and show a 3% variation from standard sample to standard sample. We will discuss our operational experience with this instrument and show results from various calibrations using different carrier gases. We are evaluating both steady state and pulse modes along with appropriate data analysis methods. More recently we have begun to consider the analysis of samples other than gas. We have implemented a tube furnace to heat samples to desorb He<sup>4</sup> from samples such as metal foils. We are also developing a system to electrically heat metal samples to desorb He<sup>4</sup>. Preliminary results with these systems will be discussed.