# ISOTOPE FRACTIONATION OF GASES IN PRESSURIZED CYLINDERS EXPOSED TO VARIABLE TEMPERATURES

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This work examines fractionation of H, C and O isotopes of pressurized gases ($H_2$ and $CO_2$) when those gases are exposed to both low (-27.1 °C) and high (up to +43.5 °C) temperatures. These temperatures were chosen to mimic outdoor conditions that stable isotope laboratory practitioners may encounter when storing compressed gas cylinders containing stable isotope working reference gases. No observable H isotope fractionations were seen for compressed hydrogen gas when subjected to these temperature fluctuations. However, for pressurized single phase and dual phase carbon dioxide the C and O isotope fractionations can be significant and measurable when subjected to low temperatures.. Initial cold cylinder $CO_2$, when first removed from a freezer, tended to be the most O-18 depleted and C-13 enriched. As the cylinder warmed to laboratory temperature, both liquid and vapor equilibrated and C and O homogenized isotopically, returning to their pre-cooled isotope values. A separate dual phase pressurized $CO_2$ cylinder was kept at a constant laboratory temperature as a control. This $CO_2$ showed no measurable C or O isotope variation throughout the duration of the experiment.