Isotopic Exchange between CO$_2$-H$_2$O and CO$_2$-H$_3$PO$_4$

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Previous studies (Mills & Urey, 1940; Affek, 2013; Clog et al., 2015) have investigated the rates of oxygen isotopic exchange with CO$_2$ and H$_2$O, as well as the $\Delta_{47}$ for CO$_2$ with liquid water. The understanding of the kinetics of these reactions has led to knowledge of the ease of equilibration of CO$_2$ in the presence of water. We analyze samples at higher temperatures (100°C) than most other laboratories, and are thus interested in the cost of higher water vapor pressures associated with faster reaction times afforded by higher temperatures. Questions remain unanswered surrounding the ease of re-equilibration of CO$_2$ in the presence of liquid water and phosphoric acid in digestion for clumped isotope analyses. We will investigate the kinetics of isotopic exchange between CO$_2$ and H$_2$O as well as CO$_2$ and H$_3$PO$_4$ at 0°C, 25°C and 100°C on varying intervals of time. Exchange between stochastic CO$_2$ and ice (0°C) will be investigated in order to observe the possibility of isotope exchange between a solid and a gas. Such isotope exchange may affect reference frames in different laboratories, contributing to the presence of different sloped calibration lines between laboratories.