2.2.P07

Oxgen isotope equilibrium fractionation between inorganic rhodochrosite ($MnCO_3$) and water at low temperatures

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Because no oxygen isotope fractionations between rhodochrosite ($MnCO_3$) and water were reported yet at low temperature ranges, rhodochrosite was precipitated from a $Na–Mn^{+2}–Cl–HCO_3^-$ solution in the laboratory at two different temperatures (10 and 25° C) and was examined for its purity with an automated X-ray power diffractometer. Oxygen isotope composition and pH of the solution were monitored before and after rhodochrosite precipitation. For the inorganically precipitated rhodochrosites, oxygen isotope compositions were determined by the conventional H3PO4 method at 25°C. The conventional acid fractionation factor for calcite, 1.01025, was applied to our rhodochrosite samples for the time being because the acid fractionation factor of our own synthetic rhodochrosite is not yet determined.

The results of equilibrium experiments yielded a preliminary relation for oxygen isotope fractionation between rhodochrosite and water at low temperatures:

$$1000 \ln\alpha(MnCO_3–H_2O) = 17.18(103/T\text{-}1) – 28.44$$

where α is the fractionatoin factor, and T is the temperature in kelvin.

Though a more precise acid fractionation factor should be obtained by additional experiments, our present data on temperature dependence of the fractionation factor, $\alpha(MnCO_3–H_2O)$, may provide a new insight for rhodochrosite found in lacustrine and marine sediments and in hydrothermal ore deposits.

2.2.P08

Diamonds from humus and other gas-phase related reactions in impactites

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Impact events are frequently restricted to interacting with only the uppermost parts of the Earth surface. Heating of these parts leads to the evolution of gas from hydrous minerals and carbonaceous compounds from the humic matter. During the latest stages the impact degas against essentially normal atmospheric pressure. We have searched for evidence of these late reactions by SEM investigations of the vacuole surface morphology in impactite from Henbury, Australia. The observations indicate that ultra fast flow of gas though nozzles cause partial remelting and reshaping of the surface layer. Thin walls between vacuoles may be subject to mass transport creating new microimpact structures (deep fry pizza type impacts) in the material driven by the differential pressure of the vacuoles.

In a few instances diamonds growing into vacuoles have been observed (see below). Because the major source of carbon in the affected sediment is humic material it implies a conversion of this unstructured matter into crystalline diamond by a gas phase deposition.