

Examination of noble gas concentration by percolation by using ceramic membrane

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Noble gas elements generally show the characteristics of chemical inactiveness and small molecular weight. In earth scientific studies, it is important to quantify noble gasses by some chemical methods. However, the measurement of extremely low concentrations of isotopic species of noble gasses has not been an easy issue so far. In this presentation, we have examined ceramic membrane to achieve higher concentration of noble gasses, and developed evaluation method the performance of the membrane.

This membrane is made of three layers supporting substrate, intermediate layer and active layer. By this structure, it is expected that gases with lager molecules diameter (N_2, O_2, Ar) cannot pass membrane and small gasses (He) selectively pass membrane.

We made the air permeation experiments using quadrupole mass spectrometer with a variety of temperature conditions, and evaluated performance of membrane by permeance and concentration factor.

$$P = M / (dp * S * t)$$

(P: permeance, M: amount of transmission, dp: differential pressure, S: membrane area, t: time)

$$A = C' / C$$

(A : Concentration factor C' : before transmission C: concentration after transmission)

As a result, N_2, O_2, Ar gasses which account for majority of air showed almost the same permeance with pure gas experiment and He gas showed lower permeance than pure gas experiment but concentration factor was about 10. In this presentation, we show experimental results and discuss isotope fractionation.