

Measurements of the D/H-ratio in hydrogen and
water vapour collected on the volcanic island
Surtsey during the year 1965 (continued)

by

Bragi Arnason
University of Iceland, Physical Laboratory
Reykjavik, Iceland

During the year 1965 collection of gas in Surtsey was continued. More trips were made to the island, but in only one of them did the circumstances allow the collection of pure magmatic gases. This was at February 21st. On that day it was possible to enter the main crater and to get quite close to the eruption vent. Some small gas chimneys were found. The chimneys were similar to that found on October 15th 1964 and described in an earlier report¹⁾.

We started to collect gas samples from a chimney approx. 100 cm in diameter. After collecting the first sample, the behaviour of the gas flux began to change and after the third sample had been obtained it was obvious that the gas was now mixed with atmospheric air.

Then a new chimney was sought and found. This chimney was only 5-10 cm in diameter. Another five water samples and two gas samples were collected from the second chimney.

The method of collection and analysis is the same as described in the previous report.

The results are expressed as deuterium depletion (negative δ value) relative to SMOW (Standard Mean Ocean Water, having D/H-ratio of about $158 \cdot 10^{-6}$)²⁾.

The accuracy is within ± 0.1 percent for the water analysis and ± 0.2 percent for the gas analysis.

The results are listed in Tab. 1.

Two of the analyses on hydrogen gas, sample no. 6 and 8, show almost the same result as the previous one from October 15th 1964. Gas sample no. 2 is approx. 4 percent higher. This sample is thought to be contaminated with a small quantity of atmospheric air. The analyses of the water samples are in good agreement with the data obtained on October 15th and November 25th 1964.

According to Sigvaldason and Elisson³⁾ the gas contained 86.16 percent water vapour and 4.72 percent hydrogen. Using this data for sample no. 6 and 8 the δ -value for the total hydrogen escaping from the magma is calculated and listed in column 4.

Table.1. Measurements on the D/H-ratio in hydrogen and water vapour collected in Surtsey on February 21st 1965.

Sample no.	Water % δ	H ₂ -gas % δ	Total hydrogen % δ
1	- 5,08		
2	- 4,82	- 11,0	
3	- 4,73		
4	- 4,72		
5	- 4,95		
6	- 5,02	- 14,85	- 5,55
7	- 4,85		
8	- 4,88	- 15,65	- 5,45

References:

- 1) Bragi Arnason (1965): Measurements on the D/H-ratio in H₂-gas and water vapour collected at the volcanic island Surtsey during the year 1964. Surtsey research progress report I, p. 27-33.

- 2) H. Craig (1961): Standard for reporting concentrations of deuterium and oxygen-18 in natural waters. Science, Vol. 133, No. 3467, p. 1833-1834.
- 3) G. Sigvaldason and G. Elísson, this report.