

G E O C H E M I S T R Y

Measurements on the D/H - ratio in hydrogen and
water vapour collected at Surtsey (continued III)

by

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After the lavaeruption had started again in Surtsey gas bubbles were observed in the sea in the neighbourhood of out-pouring lava. On August 29th a considerable lavaflow entered the sea about 500 m ESE of the crater. Gas bubbles were seen to rise to the surface of the sea out to a distance of 150 m where the depth was 60 m. In certain places the bubble activity was so strong that it caused a local upwelling of the sea. The temperature of this upwelling water was the same as in the surrounding sea, 12°C. Altogether the bubbles covered an area of about 2 hectares.

The gas was sampled by directing the bubbles through a funnel into a glass flask.

On September 2nd, 1966, some gas samples were collected from a lavastream originating in one of the new craters. The lava flowed out of the crater through an open channel for a distance of 100 m. There it entered a closed channel and the gases were collected from a small chimney in its roof.

On March 31st, 1967, it was possible to get quite close to the crater and a small chimney was found from which the gases were collected. The circumstances on this day were similar to those on October 15th, 1964, and February 21st, 1965, described in the previous paper (1).

The method of collection on September 2nd, 1966, and March 31st, 1967, is similar to that previously described (1) except when, on September 9th, 1966, a fused silica tube was used instead of a stainless steel tube.

The method of analysis is the same as described in the previous paper (1). 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 $\pm 0,1$ percent for the water analysis and $\pm 0,2$ percent for the gas analysis.

The results are listed in Table 1.

Column 6 and 7 of Table 1 further shows the mole percent of hydrogen and water vapour, measured by G. Sigvaldason and G. Elísson (3), and from these data the δ value for the total hydrogen escaping from the lava is calculated and listed in column 8.

TABLE I

Measurements of the D/H - ratio in hydrogen gas and water vapour collected at Surtsey

	Date of Sampling	Sample No.	Water δ %	H ₂ -gas δ %	Water mole %	Hydrogen mole %	Total hydrogen δ %
collected from the sea	August 29th 1966	1		-22,16		53,8	
		2		-21,48		43,4	
collected from the sea	Sept. 2nd 1966	3	-4,44	-12,76	78,5	1,59	-4,65
		4	-4,35				
		5	-4,20				
collected from the sea	March 31st 1967	6	-5,30	-15,25	90,7	2,55	5,53
		7	-5,29	-15,65	90,4	1,71	5,49
		8	-5,31	-15,80	87,6	1,64	5,51
		9	-5,33				

References

- (1) Bragi Arnason (1965 and 1966). Measurements on the D/H - ratio in hydrogen gas and water vapour collected at the volcanic island Surtsey during the year 1964 and 1965. Surtsey research progress report I, p. 27-33, and II, p. 111-113.
- (2) H. Craig (1961). Standard for reporting concentrations of deuterium and oxygen - 18 in natural water. Science, Vol. 133, No. 3467, p. 1833-1834.
- (3) G. Sigvaldason and G. Elísson, this report.