# Water Soluble Leachate of Volcanic Ash from Surtsey

by
Gudmundur Sigvaldason
The Industrial Research and Development Institute
and
Sturla Fridriksson
The Agricultural Research Institute

Loose cinder and ash covers a great part of the central area and the northern slopes of Surtsey. This substrate was formed during the first phase of the eruption when tephra was erupted from the submarine crater and piled up in a cone shaped island. This substrate was therefore continuously mixed with ocean water as it was being formed, and in 1966, when tested for soluble mineral content, it still had a high salt content.

No growth has so far started on this substrate, possibly due partly to the high salinity (0.7 g NaCl/1 kg) and the large amount of $CaSO_4$.

A sample of 6 kg was collected from a 20 cm thick surface layer approximately 80 m above sealevel on the northern slope of the island.

The total sample was leached thoroughly with distilled water. Altogether 7.29 g of dissolved salt were found in the leachate. An analysis of the leachate is presented in Table I.

The balance between cations (124.5 eqv.) and anions (116.5 eqv.) is fair.

Assuming that the reactions between the tuffaceous material and sea water does not involve chloride, the gain or loss of chemical elements in the leachate relative to sea water can be calculated (Table I).

TABLE I

Analysis of leachate of ash from Surtsey compared with sea water

| Element | Leachate of Surtsey ash mg/l | Sea water mg/l | Relative gain on equal Cl-basis | |
|---|---|---|---|---|
| | | | El. $\frac{\text{Cl ocean}}{\text{Cl Surtsey}}$ | % |
| Ca | 535 | 410 | 3563 | 24 14 |
| Mg | 252 | 1280 | 1678 | 3 05 |
| Na | 1710 | 10470 | 11389 | 7 04 |
| K | 106 | 380 | 706 | 2.50 |
| Cl | 2850 | 18970 | 18970 | |
| $SO_4$ | 1642 | 2650 | 10936 | 63 27 |
| $HCO_3$ | 3,7 | 140 | | |
| F | 0,6 | | | |
| $PO_4$ | 4,5 | | | |
| $SiO_2$ | 52,0 | | | |

Large amount of $CaSO_4$ in excess of $CaSO_4$ in normal sea water indicates that sea has been sprayed repeatedly over the ash. This sea water has evaporated and precipitated $CaSO_4$ which has not been leached out again to the same extent as other components during rainy weather. A slight but probably significant increase relative to sea water is found in other components such as Na, K and Mg. A part of this material as well as silica has probably been leached out of the rocks.