

the fixation of potassium must reach formidable dimensions, since the purest Green sands may contain 7 to 8 per cent of  $K_2O$ . Nevertheless over the whole ocean it is hardly probable that deposition keeps pace with supply, and potassium may be regarded as one of those elements which are slowly concentrating in sea-water.

Phillipsite.

The zeolite phillipsite is the only substance produced in well-developed crystalline forms at the bottom of the sea, where it is peculiar to the deepest Red clay regions. Marine phillipsite is a hydrated calcium-aluminium silicate in which the principal minor bases are potash and soda (4 to 5 per cent each of  $K_2O$  and  $Na_2O$ ), with insignificant amounts of lime and magnesia. Like all zeolites, it must have been deposited out of a solution of its constituents, and it represents an intermediate stage in the degradation of rock-silicates to clay. Why should the process of degradation have been arrested at this stage? In all probability because solutions containing silica, alumina, and the other elements in just the right proportions were imprisoned in interstices of the Red clay, secure from diffusion, and therefore available for the slow process of crystallisation. It is worthy of note that in point of percentage quantity the minor bases of marine phillipsite differ widely from those of the terrestrial mineral, in which latter calcium plays the chief part. Taking into account the well-known faculty possessed by zeolites of exchanging bases with solutions with which they are in contact we have here (especially in the high percentage of  $Na_2O$ ) an interesting effect of sea-water as a medium in the mineralogical world, comparable with its far-reaching biological effects. Why the crystallographical species phillipsite should be favoured rather than any other zeolite, we cannot in the present state of knowledge imagine.

Concretionary substances.

The chief submarine concretionary substances are, in descending order of abundance, manganese and iron peroxides, calcium phosphate, calcium carbonate, and barium sulphate. A tendency to assume concretionary forms argues proneness to supersaturation and feebly crystalline habit on the part of the substance concerned. The former property is very characteristic of the peroxides and of calcium phosphate, and is evidently connected with the reluctance to come to equilibrium in solution which so often goes hand in hand with high valencies.<sup>1</sup> Wherever concretions are found, we must suppose that there has at one time been a layer, or a chronological series of layers,

<sup>1</sup> See Van t'Hoff, *Sitzungsber. K. Akad. Wiss. Berlin*, vol. xxxiv. p. 658, 1907.