

green casts, 60 per cent. of dark green casts, along with 5 per cent. of mineral particles and siliceous organisms. The substance used for Analysis No. 87 contained 30 per cent. of white, pale grey, and yellow casts, 40 per cent. of pale green casts, 20 per cent. of dark green casts, together with 10 per cent. of mineral particles and siliceous organisms. The substance used for Analysis No. 88 contained about 10 per cent. of mineral particles similar to those mentioned in the description of the deposit (see p. 93), in spite of every care to obtain the red-coloured casts as pure as possible.

| Station. | Depth in Fathoms. | No. | SiO <sub>2</sub> | Al <sub>2</sub> O <sub>3</sub> | Fe <sub>2</sub> O <sub>3</sub> | FeO  | MnO   | CaO  | MgO  | K <sub>2</sub> O | Na <sub>2</sub> O | H <sub>2</sub> O | Total. |
|----------|-------------------|-----|------------------|--------------------------------|--------------------------------|------|-------|------|------|------------------|-------------------|------------------|--------|
| 164B     | 410               | 84  | 56.62            | 12.54                          | 15.63                          | 1.18 | trace | 1.69 | 2.49 | 2.52             | 0.90              | 6.84             | 100.41 |
| 164B     | 410               | 85  | 50.85            | 8.92                           | 24.40                          | 1.66 | trace | 1.26 | 3.13 | 4.21             | 0.25              | 5.55             | 100.23 |
| 164B     | 410               | 86  | 51.80            | 8.67                           | 24.21                          | 1.54 | trace | 1.27 | 3.04 | 3.86             | 0.25              | 5.68             | 100.32 |
| 164B     | 410               | 87  | 55.17            | 8.12                           | 21.59                          | 1.95 | trace | 1.34 | 2.83 | 3.36             | 0.27              | 5.76             | 100.39 |
| 185B     | 155               | 88  | 27.74            | 13.02                          | 39.93                          | 1.76 | trace | 1.19 | 4.62 | 0.95             | 0.62              | 10.85            | 100.68 |

While, then, there is a certain amount of agreement as to the chemical composition of glauconite, there is a wide divergence of opinion as to the immediate conditions which determine the formation of this mineral at the sea-bottom. Two principal opinions have been expressed.<sup>1</sup> Before the time of Ehrenberg attention had not been called to the remarkable fact that the grains of glauconite sometimes carried the impress of the calcareous organisms in whose cavities they were moulded. He concluded that this mineral was always formed through the activity of the creatures whose impress he had discovered.<sup>2</sup> This opinion was disputed in 1860 by Reuss,<sup>3</sup> who believed that the grains of glauconite might be concretions, not moulds, formed outside of the Foraminiferous and other shells, although he admits that some glauconitic grains are internal casts.

From all that we have already stated in this chapter, it appears certain that glauconite is principally developed in the interior of Foraminiferous shells and other calcareous structures, and that all the transitions can be observed from chambers filled with a yellowish brown mass to grains that have almost completely lost the impress of the organisms in which they were formed. From this fact, as well as from direct observations of the various constituents of the deposits, it is uncertain, and indeed little probable, that there are any minute grains of glauconite formed in a free state in the mud. We are therefore inclined to regard glauconite as having its initial formation in the cavities of calcareous organisms, although we have admitted above that some grains, which might be

<sup>1</sup> For the various hypotheses as to the mode of formation of glauconite see Gümbel, "Über die Natur und Bildungsweise des Glaukonits," *Sitzungsb. d. k. Akad. München*, Bd. xvi. Math. Phys. Kl., pp. 417-449, 1886.

<sup>2</sup> Ehrenberg, "Ueber den Grünsand und seine Erläuterung des organischen Lebens," *Abh. d. k. Akad. Wiss. Berlin*, 1855, Phys. Abh., pp. 85-176.

<sup>3</sup> Reuss, "Einige Bemerkungen über den Grünsand," *Sitzungsb. d. k. Akad. Wiss. Wien*, Bd. xl. Naturw. Kl., pp. 167-172, 1860.