. John Murray & Rev. A.F. Renard, Report on the Deep-Sea Deposits Collected During the Voyage of H.M.S. Challenge

which the edges P/M and P/k could be definitely determined as the axes of twinning. The plane of composition was principally either P or M when penetration twins were not observed.

Crystallites are very often observed in these vitreous lapilli although no crystal has as yet been developed, and these elementary crystalline forms occur under various aspects. In certain cases they are merely parallel streaks, traversed by others at right angles, thus forming groups whose dimensions do not exceed 0·05 mm. At other times these fibres are simply parallel, and not crossed by others. In other cases they diverge at the two extremities of the group; the arborescent disposition found among the microliths of certain pechsteins has, however, never been observed. Finally, they may be disposed as little fans, or irregularly interlaced and forming balls; sometimes the vitreous matter has undergone the initial stage of globulitic devitrification. When these crystallites are examined with a very high magnifying power, they are observed to be transparent, with a brownish tint. Around crystals of olivine they generally assume a regular disposition, the crystallites being arranged parallelly and perpendicularly to the crystallographic axis of the mineral. This layer of crystallites is sometimes composed of five or six rows; at other times there are but one or two (see Pl. XVI. fig. 2). In certain of the preparations of these vitreous lapilli the products of crystallitic devitrification are so crowded together that they render the base almost entirely opaque. Around these groups of crystallites the brown glass is observed to be sensibly decolorised, as is often the case when the pigmentary matter of the base is concentrated in crystals or microliths.

Black opaque spots without metallic reflection are often present, being more or less mammillated and elongated (see Pl. XVI. fig. 1). When these spots are along lines of fissure they are almost certainly more or less dendritic infiltrations of manganese (see Pl. XVII. figs. 1–3), but when embedded in the unaltered vitreous material they must be regarded as segregations of the fundamental mass, and, under very high powers, they can often be resolved into groups of crystallites, closely packed the one against the other. This is proved by the examination of the periphery of these black spots, for when the crystallites which constitute the groups can be observed upon the borders, they appear to be individualised. It has just been remarked that manganese is infiltrated into the fissures of these basic glasses; the dissemination of this substance is so great, indeed, that it is sure to be found in all the preparations of rocks dredged from points where these vitreous fragments occur in abundance. It is possible, without the aid of chemical reaction, to recognise the manganese by its microscopic characters. The colour of the altered vitreous parts is red or brownish yellow, and they present the zones of decomposition, together with embedded crystals. The parts invaded by the manganese are brownish, and the transparency is then almost lost, or they may become in places quite opaque. The infiltrations of manganese do not affect polarised light.

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