

was the general condition of the whole molten mass at the time of eruption, and that the present crystalline structure of the rock was developed during cooling and consolidation. The glassy forms of basalt undergo alteration into a yellowish substance called Palagonite (p. 242). It is worthy of remark that in the analyses of vitreous basalts, the percentage of silica rises usually above, while their specific gravity falls below, that of ordinary crystalline basalt.

The average composition of basalt is—silica, 45–55; alumina, 10–18; lime, 7–14; magnesia, 3–10; oxides of iron and manganese, 9–16; potash, 0·5–3; soda, 2–5. Loss by ignition (water, etc.), 1–5; specific gravity, 2·85–3·10.

The basalt-rocks are thoroughly volcanic in origin, appearing in lava-streams, plateaus, sills, necks, dikes, and veins. The columnar structure is so common among the finer-grained varieties that the term “basaltic” has been popularly used to denote it. As already stated, it has been assumed by some writers that basalt did not begin to be erupted until the Tertiary period. But true basalt occurs abundantly in Scotland as a product of Lower Carboniferous volcanoes, and exhibits there a variety of types of minute structure.²⁰¹

Basic Pumice.—Though the acid lavas furnish most of the pumice with which we are familiar, some of the basic kinds also assume a similar structure. Thus at Hawaii, the basic pyroxenic or olivine lavas give rise to a pumiceous froth.

Melaphyre—a name originally proposed by Brongniart and subsequently applied in various senses by different writers to include rocks which range in structure and composition from the more basic andesites to true olivine-basalts. The melaphyres for the most part belong to pre-Tertiary eruptions (though some Tertiary lavas have been described as melaphyre) and have undergone more or less alteration. If the word is to be retained as a definite rock-name it should be restricted to an altered type, as is now generally agreed, and preferentially to the older altered basalts. The melaphyres will then bear somewhat the same relation to the basalts that the diabases do to the dolerites and the porphyrites to the andesites. But it must necessarily happen that difficulty will be experienced in deciding which of the three

²⁰¹ See Trans. Roy. Soc. Edin. xxix. (1879), p. 437, and Presidential Address, Quart. Journ. Geol. Soc. (1892), p. 129, where the types of microscopic structure observed by Dr. Hatch are enumerated.