

The black, greenish black or brownish black varieties are mostly aluminous, and invariably so when they enter into the constitution of original rocks. In the latter case the quantities of their components oscillate between the following limits.

|                         |                |           |
|-------------------------|----------------|-----------|
| Silica. ....            | 50.04 to 39.62 | per cent. |
| Alumina. ....           | 26.00 to 8.85  | "         |
| Peroxide of Iron. ....  | 10.28 to 0.00  | "         |
| Protoxide of Iron. .... | 22.22 to 4.55  | "         |
| Magnesia. ....          | 21.12 to 2.00  | "         |
| Lime. ....              | 12.65 to 8.00  | "         |
| Soda. ....              | 2.24 to 0.00   | "         |
| Potash. ....            | 2.18 to 0.00   | "         |

The weathering of hornblende resembles in rationale that of the feldspars. The silicate of protoxide of iron is, in an early stage, decomposed by carbonic acid, the resulting carbonate being at once decomposed by atmospheric oxygen, and the peroxides of iron deposited as ochre yellow hydrate on the surface of the hornblende. Sometimes a shining violet coating of ferrous ferric oxide is first produced, which however gradually changes to peroxide. This process then progresses accompanied by a decomposition of the silicates of lime and magnesia also, the lime and then the magnesia being removed as carbonates. The alkalis in combination with silica and carbonic acid also disappear leaving at last a leather yellow ferruginous clay. Quite a different product results however when atmospheric oxygen is excluded and water, containing carbonic acid, alone has access to the hornblende, which is the case when it is contained in deeper lying portions of the rock. In this case the whole of the lime is removed as carbonate, together with the alkalis and part of the silica and chlorite is produced. Some of the magnesia and protoxide of iron may likewise be removed by the carbonic acid, chlorite still being the result. In the decomposition of very ferruginous hornblende, containing little magnesia, the product is often ferruginous chlorite or cleesite. When however the greater part of the bases disappear, a sort of Fullers earth (smectite) is produced, while, at the same time, quartz, iron spar, dolomite, brown spar, and calc spar become deposited in the minute cracks of the rock. (Senft Felsgemengtheile p. 631.) This decomposition of hornblende with exclusion of oxygen is, as before explained, alteration, while the common decomposition in contact with air is understood by the term weathering.

Pyroxene much resembles hornblende in chemical composition. The components are the same and their quantities equally as much subject to alteration. Alumina is frequently present but