

of carbon dioxide, as this oxide is replaced by the more powerful acid. Hence effervescence is an indication of the presence of carbonates, and when brisk is specially characteristic of calcium-carbonate. Limestone and markedly calcareous rocks may thus at once be detected. By the same means, the decomposition of such rocks as dolerite may be traced to a considerable distance inward from the surface, the original lime-bearing silicate of the rock having been decomposed by infiltrating rain-water, and partially converted into carbonate of lime. This carbonate being far more sensitive to the acid-test than the other carbonates usually to be met with among rocks, a drop of weak cold acid suffices to produce abundant effervescence even from a crystalline face. But the effervescence becomes much more marked if we apply the acid to the powder of the stone. For this purpose, a scratch may be made and then touched with acid, when a more or less copious discharge of carbonic acid may be obtained, where otherwise it might appear so feebly as perhaps even to escape observation. Some carbonates, dolomite for example, are hardly affected by acid until it is heated. This is done by placing some fragments of the substance at the bottom of a test-tube, covering them with acid and applying a flame.

It is a convenient method of roughly estimating the purity of a limestone, to place a fragment of the rock in acid. If there is much impurity (clay, sand, oxide of iron, etc.), this will remain behind as an insoluble residue, and may then be further tested chemically, or examined with the microscope. In this way many limestones among the crystalline schists may be dissolved in acetic acid, leaving a residue of pyroxenes, amphiboles, micas or other silicates. Of course the acid, especially if strong mineral acid is employed, may attack some of the non-calcareous constituents, so that it cannot be concluded that the residue absolutely represents everything present in the rock except the carbonate of lime; but the proportion of non-calcareous matter so dissolved by the acid will usually be small.

*Further chemical processes.*—A thorough chemical analysis of a rock or mineral is indispensable for the elucidation of its composition. But there are several processes by which, until that complete analysis has been made, the geologist may add to his knowledge of the chemical nature of the objects of his study. It is commonly the case that minerals about which he may be doubtful are precisely