

preciable quantity in the gabbro of the west of Scotland. It occurs also in the basalts of Bohemia and Greenland.¹⁴

In the great majority of cases the OXIDES occur combined with some acid. A few uncombined take a prominent place as essential constituents or frequent ingredients of rocks, especially the oxides of silicon and iron.

2. SILICA (SiO_2) is found in three chief forms, Quartz, Tridymite, and Opal.

Quartz is abundant as (1) an essential constituent of rocks, as in granite, gneiss, mica-schist, rhyolite (quartz-trachyte), quartz-porphry, sandstone; (2) a secondary ingredient, wholly or partially filling veins, joints, cracks, and cavities. It has been produced from (a) igneous action, as in volcanic rocks; (b) aquo-igneous or plutonic action, as in granites, gneisses, etc.; (c) solution in water, as where it lines cavities or replaces other minerals. The last mode of formation is that of the crystallized quartz and chalcedony found as secondary ingredients in rocks.

The study of the endomorphs and pseudomorphs of quartz is of great importance in the investigation of the history of rocks. No mineral is so conspicuous for the variety of other minerals inclosed within it. In some secondary quartz-crystals, each prism forms a small mineralogical cabinet inclosing a dozen or more distinct minerals, as rutile, hæmatite, limonite, pyrites, chlorite, and many others.¹⁵ Quartz may be observed replacing calcite, aragonite, siderite, gypsum, rock-salt, hæmatite, etc. This facility of replacement makes silica one of the most valuable

¹⁴ Nordenskiöld describes fifteen blocks of iron on the island of Disco, Greenland, the weight of the two largest being 21,000 and 8000 kilogrammes (20 and 8 tons, respectively). He observed that at the same locality, the underlying basalt contains lenticular and disk-shaped blocks of precisely similar iron, and inferred that the whole of the blocks may belong to a meteoric shower which fell during the time (Tertiary) when the basalt was poured out at the surface. He dismissed the suggestion that the iron could possibly be of telluric origin (*Geol. Mag.* ix. (1872) p. 462). But the microscope reveals in this basalt the presence of minute particles of native iron which, associated with viridite, are molded round the crystals of labradorite and augite (Fouqué and Michel-Lévy, *op. cit.* p. 443). Steenstrup, Daubrée, and others appear therefore to be justified in regarding this iron as derived from the inner metallic portions of the globe, which lie at depths inaccessible to our observations, but from which the vast Greenland basalt eruptions have brought up traces to the surface (K. J. T. Steenstrup, *Vid. Medd. Nat. Foren. Copenhagen* (1875) Nos. 16-19, p. 284; *Zeitsch. Deutsch. Geol. Ges.* xxviii. (1876) p. 225; *Mineralog. Mag.* July, 1884. F. Wöhler, *Neues Jahrb.* 1879, p. 832. Daubrée, *Discours Acad. Sci.* 1 March, 1880, p. 17. W. Flight, *Geol. Mag.* ii. (2d ser.) p. 152.

¹⁵ See Sullivan, in Jukes' "Manual of Geology," 3d. edit. (1872), p. 61.