

under "Chloritization," *postea*, p. 1040.) Among the minerals grouped under the general head of chlorites are *Chlorophæite*, *Clinochlore*, *Delessite*, *Pennine*, *Ripidolite*, and others.

**Ottrelite** (Chloritoid,  $H_2O$  (FeMg)  $Al_2SiO_7$ ) occurs in small lustrous iron-black or greenish-black lozenge-shaped or six-side plates in certain schists. It resembles chlorite but is at once distinguishable from that mineral by its much greater hardness.

**Serpentine** (MgO 28-43, FeO 1-10.8,  $Al_2O_3$  0-5.5,  $SiO_2$  37.5-44.5,  $H_2O$  9.5-14.6) is a product of the alteration of pre-existing minerals, and especially of olivine. It occurs in nests, grains, threads, and veins in rocks which once contained olivine<sup>30</sup> (p. 138), also massive as a rock, in which it has replaced olivine, enstatite or some other magnesian bisilicate (pp. 300, 1040). Under the microscope it presents, in very thin slices, a pale leek-green or bluish-green base, showing aggregate polarization. Through this base runs a network of dark opaque threads and veinings. Sometimes among these veinings, or through the network of green serpentinous matter in the base, the forms of original olivine crystals may be traced (Figs. 26, 27).

**Clauconite** ( $CaO$  0-4.9, MgO 0-5.9,  $K_2O$  0-12.9,  $Na_2O$  0-2.5, FeO 3-25.5,  $Fe_2O_3$  0-28.1,  $Al_2O_3$  1.5-13.3,  $SiO_2$  46.5-60.09,  $H_2O$  0-14.7). Found in many stratified formations, particularly among sandstones and limestones, where it envelops grains of sand, or fills and coats foraminifera and other organisms, giving a general green tint to the rock. It is at present being formed on the sea-floor off the coasts of Georgia and South Carolina, where Pourtales found it filling the chambers of recent polythalamia.

6. CARBONATES. This family of minerals furnishes only four which enter largely into the formation of rocks, viz. Carbonate of Calcium in its two forms, Calcite and Aragonite, Carbonate of Magnesium (and Calcium) in Dolomite, and Carbonate of Iron in Siderite.

**Calcite** ( $CaCO_3$ ) occurs as (1) an original constituent of many aqueous rocks (limestone, calcareous shale, etc.), either as a result of chemical deposition from water (calc-sinter, stalactites, etc.), or as a secretion by plants or animals;<sup>31</sup> or (2) as a secondary product resulting from weath-

<sup>30</sup> See Tschermak, Wien. Akad. lvi. 1867.

<sup>31</sup> Mr. Sorby has investigated the condition in which the calcareous matter of the harder parts of invertebrates exists. He finds, that in foraminifera, echinoderms, brachiopods, crustacea, and some lamellibranchs and gasteropods,