

molten and in the solid state. It would appear that the diminution in density, as rocks pass from a crystalline into a vitreous condition, is, on the whole, greater the more silica and alkali are present, and is less as the proportion of iron, lime, and alumina increases. According to Delesse, granites, quartziferous porphyries, and such highly silicated rocks lose from 8 to 11 per cent of their density when they are reduced to the condition of glass, basalts lose from 3 to 5 per cent, and lavas, including the vitreous varieties, from 0 to 4 per cent.<sup>18</sup> More recently, Mallet observed that plate-glass (taken as representative of acid or siliceous rocks) in passing from the liquid condition into solid glass contracts 1.59 per cent, 100 parts of the molten liquid measuring 98.41 when solidified; while iron-slag (having a composition not unlike that of many basic igneous rocks) contracts 6.7 per cent, 100 parts of the molten mass measuring 93.3 when cold.<sup>19</sup> By the contraction due to such changes in the internal condition of subterranean masses of rock, minor oscillations of level of the surface may be accounted for, as already stated (p. 495). Thus the vitreous solidification of a molten mass of siliceous rock 1000 feet thick might cause a subsidence of about 16 feet, while, if the rock were basic, the amount of subsidence might be 67 feet.

**Sublimation.**—It has long been known that many mineral substances can be obtained in a crystalline form from

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<sup>18</sup> Bull. Soc. Geol. France, 1847, p. 1396. Bischof had determined the contraction of granite to be as much as 25 per cent (Leonhard und Bronn, Jahrb. 1841). The correctness of this determination was disputed by D. Forbes (Geol. Mag. 1870, p. 1), who found from his own experiments that the amount of contraction must be much less. The values given by him were still much in excess of those afterward obtained with much care by Mallet. Compare O. Fisher, "Physics of the Earth's Crust," 2d Edit., p. 45, and Barus quoted ante, p. 104.

<sup>19</sup> Phil. Trans. clxiii. pp. 201, 204; clxv.; Proc. Roy. Soc. xxii. p. 328.