

silicon, boron, silver, copper, lead, zinc, cobalt, nickel, iron, manganese, aluminium, magnesium, calcium, strontium, barium, sodium, and potassium.¹⁵ To these may be added arsenic, lithium, caesium, rubidium, gold, and probably most if not all of the other elements, though in proportions too minute for detection. The chief constituents have been determined by Dittmar to be present in the proportions shown in the first column of the subjoined tables. Assuming them to occur in the combinations shown in the second column, they are present in the average ratios therein stated:¹⁶

I		II	
Chlorine.....	55.292	Chloride of sodium.....	77.758
Bromine.....	0.188	Chloride of magnesium.....	10.887
Sulphuric acid, SO ₃	6.410	Sulphate of magnesia.....	4.737
Carbonic acid, CO ₂	0.152	Sulphate of lime.....	3.600
Lime, CaO.....	1.676	Sulphate of potash.....	2.465
Magnesia, MgO.....	6.209	Bromide of magnesium.....	0.217
Potash, KO.....	1.332	Carbonate of lime.....	0.345
Soda, Na ₂ O.....	41.234		
Total Salts.....100.000		Total Salts.....100.000	
Subtract Basic Oxygen equiv- alent to the Halogens } 12.493			

Sea-water is appreciably alkaline, its alkalinity being due to the presence of carbonates, of which carbonate of lime is one.¹⁷ In addition to its salts it always contains dissolved

¹⁵ Forchhammer, Phil. Trans. clv. p. 205. According to Thorpe and Morton (Chem. Soc. Journ. xxiv. p. 507), the water of the Irish Sea contains in summer rather more salts than in winter. In 1000 grammes of the summer water of the Irish Sea they found 0.04754 grammes of carbonate of lime, 0.00503 of ferrous carbonate and traces of silicic acid. For exhaustive chemical investigations regarding the chemistry of ocean-water consult Dittmar, in vol. i. "Physics and Chemistry," Report of Voyage of the "Challenger," 1884; also the "Chemistry" part of the Report of the Norwegian North-Atlantic Expedition, 1876-1878.

¹⁶ Dittmar, op. cit. p. 203 *et seq.* For further reference to the chemistry of sea-water, especially in connection with the action of marine organisms, see *postea*, p. 484.

¹⁷ Dittmar, op. cit. p. 206.