

is dull, dirty brown, earthy, soiling the fingers, and easily scratched with a knife. The streak is reddish brown or chestnut brown, like the hydrated oxides: manganite and hausmanite. The hardness is variable, being greater in the purer specimens, which are capable of taking on a beautiful polish with a bluish black reflection, like that of psilomelane. Sometimes little divergent crystalline fibres, resembling pyrolusite, may be observed. When freshly taken from the sea, they were soft, heavy, and easily pared down with a knife; they have on drying become harder, lighter, and much more brittle. These concretions present in the different specimens the characters found in quite distinct oxides of manganese, and as we shall see they are made up of a mixture of these different oxides. Fused with soda they give the reaction of manganate of sodium; chlorine is set free when they are attacked by hydrochloric acid. The somewhat low specific gravity of most specimens is remarkable, this being evidently due to the mixture of foreign substances, and in some instances to the nucleus of pumice.

The following analyses show clearly the mixed composition of the nodules. Among the substances indicated by the analyses, the oxides of manganese are the most abundant, and these may make up more than one-half of the total mass of the nodules. The hydrated oxide of iron is nearly as abundant as that of manganese, indeed in not a few instances the peroxide of iron present in the nodules exceeds the peroxide of manganese. In addition to these oxides of manganese and iron there occur all the constituents found in the deposits in which the nodules were embedded. This is indicated by the hydrated silica often in excess of the alumina, and may be due to the presence of the skeletons of siliceous organisms. The carbonate and phosphate of lime, as well as the carbonate of magnesia, point to the presence of carbonate of lime shells and other organic remains. In the insoluble portion there is evidence of anhydrous silicates, referable no doubt to the small fragments of volcanic rocks and minerals, answering to silicates of alumina, iron, lime, magnesia, and alkalies, enclosed along with the deposit in the zones of growth. Finally nickel, cobalt, and other rare substances are indicated, as is specially shown by Dr Gibson's more detailed analysis at the end of the volume (Appendix II.).