## THE USES OF THE RARE EARTHS.

By Prof. Charles Baskerville, Ph.D., F.C.S.,

Director of the Laboratory College of the City of New York, U.S.A.

The so-called "rare earths" constitute almost a quarter of the number of known chemical elements. Many of the names found under this head refer to chemical compounds, whose definiteness of character has not been sufficiently determined to warrant their being given a place among the elements.

These earths have been classified under three groups: (1) The *cerite* earths, including cerium, lanthanum, praseodymium, neodymium (together with didymium), samarium, gadolinium and europium; (2) the *ettrite carths*, including yttrium, erbium, terbium, ytterbium, scandium, holmium and thulium; (3) the *zirconium group*, including zirconium, thorium and germanium. The classification is based on the following chemical facts: All of these earths are precipitated from acid solutions by oxalic acid. The elements of group 3 are separated from the other two groups by precipitation with sodium thiosulphate. The other two in solution are separated from each other by treatment with sodium or potassium sulphate, which precipitates the double sulphates of the cerite group, while the yttrium earths remain in solution.

The methods of extraction are somewhat complicated, hence 1 do not feel that it would be quite considerate to rehearse those found in certain works on the subject, and professional obligations prevent my speaking of others not published.

*Reagents.* Investigators in the rare-earth field have been most anxious to secure more satisfactory reagents to be used, not only for the detection, but also for the separation of this "nebula of elemental matter," as Crookes once named the yttria earths. A recounting of the numerous researches along these lines is beyond the scope of this address. A limited number of reactions have been observed with cerium which are of a contrariwise service. The result is, cerium and its compounds now serve to a degree as reagents in analytical chemistry; as such they have a value, like arsenic, osmic, molybdic and tungstic acids. The other rare earths so far have given results which exclude their consideration in this respect.