

of Iron and Alumina, such as the mineral forming the subject of this paper. As the alkalies are frequently present in appreciable quantities in clays, true Potash or Soda Alums are often formed.

When clay slates are impregnated with these sulphates they are termed Aluminous, and are sometimes rich enough to yield Alum on the commercial scale. The following outline of the process is from Dana's Mineralogy, p. 128. The rock is first slowly heated, after piling it in heaps, in order to decompose fully the pyrites, and transfer the Sulphuric Acid of any Sulphate of Iron to the Alumina, and thus produce the largest amount possible of Sulphate of Alumina. It is next lixiviated in stone cisterns. The lye containing this sulphate is afterwards concentrated by evaporation, and then the requisite proportion of Potash (sulphate or chloride, alum containing potash as well as alumina) is added to the liquid. A precipitate of Alum falls which is afterwards washed and crystalised. In France Ammoniacal Salts are used instead of Potash, and an Ammoniacal Alum is formed.

At Whitby, in Yorkshire, the business of Alum making is a very old one, having been commenced by Sir Thomas Challoner in 1460, who brought workmen from France where the process had long been kept secret as a privilege of the ecclesiastical powers. The Alum shale occurs in strata of Liassic age, and is overlaid by a hard compact stone, known locally as "dogger." The Shale bed is about 200 feet thick, and is a hard bluish gray shaly clay which rapidly crumbles on exposure. The whole deposit abounds in iron pyrites, but only the richer portions are excavated for treatment. About 65 tons of the Shale yield a ton of Alum. It would unduly extend the limits of this paper to give the full details of the manufacture, which is based on that already outlined.

In the United States there are no deposits of Alum Shale of any commercial value, but the salt is manufactured to the extent of 20,000 tons annually, valued at about \$800,000. It is nearly all made from alum clays imported from France and England. The process of manufacture is very simple and consists in mixing the Alum Shale with Sulphuric Acid, dissolving out the resulting