

UNITED STATES PATENT OFFICE.

ALDUS C. HIGGINS, OF WORCESTER, MASSACHUSETTS.

METHOD OF TREATING ALUMINOUS MATERIALS.

No. 929,219.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed May 31, 1907. Serial No. 376,567.

To all whom it may concern:

Be it known that I, ALDUS C. HIGGINS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Methods of Treating Aluminous Materials, of which the following is a specification.

The object of this invention is to prepare a material suitable for use as an abrasive or for the preparation of grinding or cutting implements or articles and for other purposes, by fusing in an electric furnace an aluminous material, as for instance anhydrous or hydrated oxid of aluminum, under such temperature conditions as will yield a substantially homogeneous and uniform product.

The material produced by the fusion of alumina, raw or calcined bauxite or other aluminous material in the electric furnace usually contains as impurities small proportions of such metals as iron, titanium and silicon, or compounds or oxids of these. As the electric furnace smelting proceeds under reducing conditions due to the use of carbon electrodes or in some cases to the admixture of small proportions of carbon with the charge, these several elements may occur in their reduced or metallic form, or as alloys, carbids or oxids, which under the ordinary conditions of operation, viz., when the material is heated merely to the temperature of quiet fusion are not uniformly disseminated throughout the product but occur therein as more or less segregated masses, which are evident in the product as dark colored or black spots or areas. The material within these spots does not possess the same abrasive qualities as the remainder of the mass; such material passes however into implements or articles prepared from the electric furnace product, and is often somewhat irregularly disseminated therein, giving rise to objectionable local variations in the composition or structure of the implements.

I have now discovered that while the segregation is often marked in the product prepared at temperatures not greatly exceeding the melting point of alumina, when the temperature is carried to a sufficiently high degree such segregation either does not occur

to any substantial or practically objectionable extent, or if segregation exists at any stage of the operation it is followed by a distribution or diffusion of the impurities throughout the highly heated and relatively mobile mass; and that the material produced under such high temperature conditions is substantially uniform and homogeneous, its value for the preparation of abrasives being practically unimpaired by the presence of the uniformly distributed or diffused impurities.

Insufficient temperature conditions in the furnace, with coincident segregation of impurities in the product, may be due to any or all of a number of causes, among which may be mentioned too low current density, too rapid feeding of the charge, and the presence in the charge of an undue proportion of water. While it is not practicable to specify a definite suitable temperature in degrees of a thermometric scale, such proper temperature is readily attained and reproduced in practice by observing the above factors and so regulating them as to secure the desired results.

The highly heated fused product is in practice permitted to solidify in the electric furnace, being preferably cooled or chilled therein as described in my copending application 307,090, filed March 20, 1906, whereby a product of exceptional toughness and hardness is produced.

I claim:

1. The method which consists in fusing an aluminous material in an electric furnace at a temperature substantially above the state of quiet fusion and sufficient to prevent substantial segregation of impurities, and recovering the resulting product in solid form.

2. The method which consists in fusing an aluminous material in an electric furnace at a temperature substantially above the state of quiet fusion and sufficient to prevent substantial segregation of impurities, and cooling or chilling the resulting product into a pig or mass.

In testimony whereof, I affix my signature in presence of two witnesses.

ALDUS C. HIGGINS.

Witnesses:

F. H. LINCOLN,
C. O. SMITH.