Refractory Bricks Manufactured with Aluminum Dross

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Aluminum and its alloys are important materials with low density, excellent mechanical properties and high electric and thermal conductivities. In particular, the market of aluminum alloys in automobile industry is growing up year by year. In the point of view on effective usage of mineral resource, recycling of aluminum and its alloys have been promoted. During smelting process of aluminum and its alloys, aluminum dross is formed by oxidizing those melts with flux such as $MgFe_2$. Aluminum dross consists of mainly aluminum oxide and hydroxide, metallic aluminum, flux and its oxidation products and aluminum nitride (AlN). Because of chemical reaction between oxygen or humidity in air with metallic Al and AlN, aluminum dross evolves H_2 and ammonia (NH_3) with heat generation. Disposal of aluminum dross requires proper treatments to remove metallic Al and AlN. In the present study, recycling of aluminum dross is proposed to fabricate refractory bricks with conventional ceramic processing. Al_2O_3 and MgO are typical oxides for refractory bricks. Use of aluminum dross can reduce the production cost of refractory bricks. Sintered aluminum dross consists of α-Al_2O_3, $MgAl_2O_4$ and $CaAl_{12}O_{19}$ with small amount of impurities such as Ca_2SiO_4. In order to achieve the industrialization of recycling of aluminum dross into refractory bricks, impurity managements are very important. Impurities of SiO_2, CaO and Cu_2O affect strongly sintering behavior of aluminum dross as well as thermal and chemical stability of the refractory bricks.