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Research Article

Influence of Alkali Treatment on the Surface Area of Aluminium Dross

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Aluminium dross is an industrial waste from aluminium refining industry and classified as toxic substances. However, the disposal of dross as a waste is a burden to aluminium manufacturer industries due to its negative effects to the ecosystem, surface, and ground water. Therefore the purpose of this study is to evaluate the influence of sodium hydroxide (NaOH) on the surface area and pore size of aluminium dross. There were 3 stages in the treatment activities, which were leaching, precipitation, and calcination process. The optimum result from this study was the surface area of aluminium dross increases from 10.1 m^2/g up to 80.0 m^2/g at 40°C, 1% NaOH, and 15-minute reaction time. Thus, aluminium dross has a potential to be converted into other useful material such as catalyst and absorbent. The benefit of this research is that the hazardous industrial waste can be turned into wealth to be used in other applications such as in catalytic activities and absorber in waste water treatment. Further investigation on the physicochemical of aluminium dross with different acid or alkali should be conducted to get deeper understanding on the aluminium dross as a catalyst-type material.

1. Introduction

Aluminium dross is one type of the industrial wastes which are generated in a recycle of an aluminium recycle process. There are three types of aluminium dross which are black dross, white dross, and salt cake. White dross is generated in aluminium smelting industries while black dross and salt cake are generated in the aluminium recycling industries. Amount and the formation of these substances depend on several factors such as the type and quality of input materials, operating conditions, the type of technology, and furnace applied. The overall chemistry depends on the alloying elements present in the molten aluminium and the metallurgical process [1]. Generally, this dross may contain Al_2O_3, AlN, Al_4C_3, SiO_2, MgO, Al, and minor quantities of Si [2]. According to Sultana et al. [3], it was estimated that 15–25 kg of dross is produced per metric tonne of molten aluminium and [4] stated that, throughout the world, it was estimated that 5 million tonnes of an aluminium dross was generated every year.

Aluminium dross is classified as a toxic industrial waste and it requires a proper treatment before it can be discharged. Majority of aluminium dross is disposed in open landfill sites, and this activity can cause harm to the environment due to the toxic ions; there is possibility of toxin ions leached out from the disposed aluminium dross into the ground water, which can cause pollution [4–6]. This substance is usually treated as a landfilled solid waste [6]. The disposal cost of this waste can be expensive; RM 2000.00 per tonne will be charged by the approved local disposal waste company for the disposal in