



## بسم الله الرحمن الرحيم

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**RECYCLING OF ALUMINIUM DROSS IN THE  
PREPARATION OF PURE CORUNDUM  
AND ALUM**

**BY**

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(B.Sc. in Chemistry) Cairo University 1981

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of the Requirements for the Master Degree  
in Environmental Sciences**

**To**

**Natural and Biological Sciences Department,  
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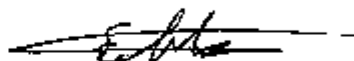


**Ain Shams University  
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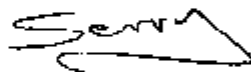
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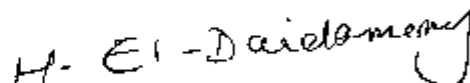
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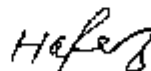
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## ABSTRACT

A representative sample of an Egyptian waste Al-dross powder is chemically recycled by water - and sulfuric acid-solutions and/or heat treatment at different conditions. The residue obtained, after each treatment, is investigated to determine the chemical and phase compositions by using wet silicate analysis method as well as XRD and TG techniques. The optimum conditions leading to separate Al ions- rich-filterate and/or pure Al-oxides residue are selected. Also, the chemical parameters that control the precipitation of pure Al-hydroxide as well as ammonium and potash alum from the obtained filterate are also studied.

The results revealed that the leaching of the Al-dross powder by water for 24 hours at temperatures up to 100°C, almost leads to complete hydrolysis of Al-metal,  $Al_4C_3$  and AlN phases into Al-hydroxides with the evolution of hydrogen, methane and ammonia gases respectively. It is concluded that treatment by 1:4 sulfuric acid solution for 8 hours at 100°C by using a S/L ratio of 0.1, causes the dissolution of most of the  $\gamma$ -alumina as well as the acid-soluble Al-compounds. This leads to obtain about 46.0% of Al-oxides residue composed mainly of  $\alpha$ - and  $\beta$ - $Al_2O_3$  as well as disordered Mg-Al-O spinel. Also, a filterate rich in  $Al^{3+}$  and  $SO_4^{2-}$  ions is obtained. On calcining

pellets made from the water - and /or acid- leached cross-powders up to 1000°C, soft bodies containing minimum  $\beta$ - $\text{Al}_2\text{O}_3$  content are obtained, which are densified on further firing up to 1400°C with the complete dissociation of  $\beta$ - $\text{Al}_2\text{O}_3$ . Meanwhile, pure Al- hydroxide gel and/or ammonium and potash alum which yields 94,265 and 298%, respectively could be precipitated from the acid- leaching filtrate. All the obtained residues and precipitates can be assessed for refractories industry and water purification processes.

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