ALUM FROM WASTE ALUMINIUM CAN

I. Process Description

The aluminum cans were collected from various waste stores/ canteens and from door to door collection. These collected cans were first cut into pieces of sufficient length with the help of a cutter so as to remove the main aluminum body from the lid, neck and the hard base of the can.

Now a thorough scrapping of the aluminum body is done to remove the label, paint and any extraneous matter from the cans. These cleaned pieces were weighed and further cut into very small pieces of almost 1 cm x 1 cm in size. These small pieces will be easier to dissolution. Figure 1 shows the small cut pieces of cans.

Fig.1. Small cut pieces of cans

These pieces were now weighed and transferred to a 1.4 M KOH solution and then tothe Swenson walker crystallizer's heater tank in a sufficient quantity to make the solution supersaturated as this works as the driving force for crystallization.

Fig.2. Pictorial view of Swenson Walker Crystallizer

The crystallization process consists of two major events, nucleation and crystal growth. Nucleation is the step where the solute molecules dispersed in the solvent start to gather into clusters, on the nanometer, that become stable under the current operating conditions. These stable clusters constitute the nuclei. However, when the clusters are not stable, they dissolve.

In this experimental work it was observed that a stable nucleation prevails at about 7 minutes after the cooling started along with the addition of sulfuric acid.The crystal growth is the subsequent growth of the nuclei that succeed in achieving the critical cluster size. Depending upon the conditions, either nucleation or growth may be predominant over the other, and as a result, crystals with different sizes and shapes are obtained.

Fig.3. Crystal growth in crystallizer

In our experiment it was observed that after a 30 minute period of time the crystal growth suddenly predominates and alum crystal of different size were obtained.

Fig.4 The final wet crystal product of alum

These crystal are then dried and a final weight of dried crystal was taken which weighs 76 gm.

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Fig.5. Dried alum crystal

It was observed that the shape of the crystal is found to be of octahedron type. Crystal size for alum was determined by considering average length of the crystal obtained which was found to be between 1.5 to 3 cm.

II. Percent Recovery

Percent recovery is defined as the amount of pure substance obtained from the initial impure substance.

$$\text{Percent Recovery } = \frac{\text{Amount of pure substance recovered}}{(\text{ Amount of initial impure substance})}$$

Amount of alum crystals formed = 76 gm
Amount of aluminum chips taken = 80 gm

$$\text{Percent Recovery } = \left(\frac{76}{80}\right) * 100$$

Therefore, Percent recovery = 95 %