# Chapter- 7

# *Conclusions*

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## Conclusions

The present work describes the utilization and recycling of white aluminium dross for the recovery of valuable products like tamarugite, potash alum, hydrogen and alumina. As illustrated in the introduction, white aluminium dross is a waste generated in the aluminium smelter plants. It is rich in metallic aluminium, alumina and salt fluxes. To utilize the metallic aluminium entrapped in it, many recycling methods and technologies have been developed.

The present work has mainly been focused in the hydrometallurgical route of recycling white aluminium dross. After the downsizing, the powdered white aluminium dross is subjected to leaching with various alkaline solutions to produce leach liquors. When potassium hydroxide solution is used, potassium aluminate is produced in the solution. Upon the addition of sulphuric acid solution into this liquor, followed by saturation and crystallization, the production of potash alum takes place.

Similarly, with sodium hydroxide solution, sodium aluminate is generated in the liquor. The addition of sulphuric acid, saturation and crystallization produces tamarugite. It is a relatively rare mineral and its applications have been explored in the field of coagulation. It has been found that it competes well with the commercial alum and the change in the pH of water is not very large, even at higher doses of coagulant.

The presence of other phases like trisodium hydrogen bisulphate and sodium hydrogen sulphate made the resultant product less pure. Therefore, another method of producing tamarugite has been developed. This involved leaching of white aluminium dross powder with sulphuric acid to produce aluminium sulphate in the liquor. Into this liquor,

the addition of sodium hydroxide solution is done. This is followed by maintaining the liquor at higher temperature and use of organic solvents for precipitation.

It has been found that the amount of other phases has reduced with the use of organic solvents and the coagulation tendency of the resultant precipitated product also increases. Therefore, it has been shown that leaching of white aluminium dross with alkaline solution produces a variety of valuable products that find its applications in industries.

Aluminium-water reaction leads to the generation of hydrogen in the presence of alkalis. This concept has been explored and the evolution of hydrogen has been studied by using white aluminium dross powder as the source of aluminium and alkaline solutions of sodium hydroxide and potassium hydroxide. Variations of temperature, concentration of solution and time have been studied to understand the gas evolution.

The residual solid obtained after the leaching has been used for the production of alumina. After collecting the residual solid, it was heated to high temperature (900 °C) to transform it into alumina. This product can be used as a raw material for the reinforcement for the production of composites.

As seen from the chapters dedicated for the utilization of white aluminium dross to generate these valuable products, the metallic aluminium present in the dross is a great resource that needs recycling. The present work has illustrated various methods for recycling the dross, reducing the environmental and industrial burden.