(ID 279)

Study of the Suitability of Dosing Polyaluminium Chloride made by Scrap Waste Aluminium for Water Treatment

Wijesinghe, L.P.R.A.N.[1], Tilakarathna, I.A.N.D.P.[2], Welikala, D.N.P.[2]*

[1]*College of Chemical Sciences, Institute of Chemistry Ceylon, Sri Lanka*
[2]*National Water Supply and Drainage Board, Sri Lanka*
*dnpw0802@yahoo.com

Abstract

Water treatment is essential to provide safe drinking water for human consumption. The National Water Supply and Drainage Board (NWSDB) is the national organization that provides safe drinking water in Sri Lanka. The conventional water treatment process includes aeration, coagulation, flocculation, sedimentation, filtration, and disinfection. Different types of coagulants - aluminium sulphate, poly-aluminium chloride, ferric sulphate, and ferric chloride are used in water treatment. NWS&DB uses aluminium sulphate and poly-aluminium chloride (PACl) as coagulants. PACl it is more effective than aluminium sulphate in water treatment. Since PACl is not being manufactured in Sri Lanka, it has to be imported. The annual requirement of PACl is 6,100 MT in NWSDB. Therefore, they have to spend around LKR 500 million to import it. When considering the prevailing economic crisis and the global pandemic, it has become a challenge. Therefore, manufacturing of PACl in Sri Lanka by using scrap aluminium will save foreign currency and will be a great opportunity for the country. This research is based on the use of scrap waste aluminium, a common by-product obtained from the Industrial Development Board, instead of Al_2O_3 (or a mineral containing Al_2O_3) which is commonly applied by most industrial producers and exhibits important benefits such as energy and time saving during the preparation procedure. Several efforts have been made to produce the pre-polymerized coagulant with properties similar to those of a commercially available PACl solution using appropriate, commonly found laboratory equipment and without the application of extreme conditions in terms of temperature or pressure. The laboratory prepared PACl was characterized mainly by means of aluminium content, basicity, density, and aluminium species distribution. Furthermore, the coagulation performance of PACl was evaluated for the treatment of water samples and compared with the performance of a commercially available PACl solution. Finally, the coagulation-flocculation kinetics were examined with the use of a jar test apparatus, and the floc growth rates between the two coagulants were compared. The results suggested that PACl can be alternatively produced under mild conditions, resulting in a product with better properties than the commercial PACl used for comparison. Additionally, if the preparation takes place on an industrial scale, a greater improvement is feasible due to the common equipment used.

Keywords: Polyaluminium chloride, Coagulant, Polymerization