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REMOVAL OF CALCIUM AND MAGNESIUM IONS FROM SLUDGE GENERATED IN ELECTROCOAGULATION AND DEVELOPMENT OF A METHOD TO SEPARATE ALUMINIUM IONS

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A sludge generated during electrocoagulation (EC) consists of harmful ions which could cause deleterious effects on the environment. Instead of simply discarding it, the ions trapped in sludge can be separated and recovered to gain economic value. The present study focused on developing a method to separate Mg^{2+}, Ca^{2+}, and Al^{3+} present in sludge. A sludge consisting of Mg^{2+}, Ca^{2+}, and Al^{3+} was generated through EC. It was dissolved in HCl, and upon the addition of NaOH, a precipitate of $Mg(OH)_2$ and $Ca(OH)_2$ was formed while Al^{3+} got converted into$[Al(OH)_4]^-$. After sucrose was added to the precipitate, $Mg(OH)_2$ remained while $Ca(OH)_2$ converted into a soluble complex of Ca^{2+}. The Ca^{2+} component was separated as $CaCO_3$ by passing CO_2 to the calcium-sucrate solution. At the end of the procedure, 53% and 68%, respectively, of $Mg(OH)_2$ and $CaCO_3$ were separated from the sludge. These high recovery percentages indicate this method is suitable for separating Ca^{2+} and $Mg^{2+,}$ and the isolated $CaCO_3$ and $Mg(OH)_2$ can be used as industrial raw material. As the recovery percentage of sucrose was 98, it is possible to reuse it in this procedure. Next, a method was developed to remove $[Al(OH)_4]^-$ in the filtrate. A polyaniline/zirconia composite (PZC) was synthesized and equilibrated with a 100 mg/l $[Al(OH)_4]^-$ solution at different pH values. These ions received a removal efficiency of 85% at pH 9. Therefore, this method could be applied to remove Al^{3+} present in the sludge after converting it into$[Al(OH)_4]^-$. The recovery percentages of Ca^{2+} and Mg^{2+} indicate that further improving this treatment method by optimizing the conditions would be beneficial in minimizing sludge disposal problems.

Keywords: Al^{3+}, Ca^{2+}, Electrocoagulation, Mg^{2+}, Polyaniline-zirconia composite