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Lithium and Boron Removal from Highly Salinated Waters

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ABSTRACT

Environmental and resources conservation problems form an important theme throughout the world. One of the ways to resolve them, developing a new technique to recover the valuable elements from natural resources is requested. Recovery of those valuable elements from nature includes developing a new technology for removing and analyzing it. Along this, developing an environment-friendly processes and the utilization of it to recover value metals from natural resources have been emphasized. Seawater has gained attention as an indispensable resource for various elements for many years.

There are several methods suggested for separating elements from high matrix solutions such as seawater. Lithium and boron elements were extracted in strongly salinated waters. Extraction procedure was performed by liquid-liquid extraction (LLE) method and ion exchange method. LLE was carried out using chelating agent (APDC/DDTC) and chloroform. Ion exchange method was carried out by bath and column techniques. Amberite IRA 743 was used as selective ion exchangers of boron and AG50W-X12 was used as that of lithium. We explored the efficiency of boron and lithium removal under controlled condition (pH, liquid/solid ratio, time of reaction, pre-treatment, regeneration). Contrary to transition metals, boron and lithium was not detected in extractant of salinated waters using LLE. The recovery of boron and lithium by ion exchanger showed very good extraction efficiency and recovery rates were over 80% and 70%, respectively.

In the analysis of high matrix samples such as waste waters and seawaters the principle obstacles arise for interference and lack of stability during instrumental analysis. Numerous researches have been tested for resolving these problems. High matrix problems due to the formation of polyatomic interferences, negative problems on

the plasma, interface, as well as ICP-MS. Determination of boron and lithium was carried out by flame AAS, ICP-AES and ICP-MS. The measurement was checked out by standard addition method for saline waters with salinity gradient. Because of high salt contents in waters, direct measurement was unstable in precision and reproducibility of measured two element values. In consideration of salt contents and levels of two ions, we found best effective analytical condition for lithium and boron measurement. The methodology might provide an alternative technique for boron and lithium removal in high matrix solutions such as waste waters and salinated waters.

Key words: lithium, boron, saline water, extraction, interference