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Production of ^{212}Pb tracer from ^{232}Th and its application to investigate lead chemistry in acidic nitro-phosphate solutions

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Abstract

Lead occurs in small amounts in the nature mainly as lead sulfide, however the main exposure and contamination are largely results of increased anthropogenic use (e.g. mining, refining, lead-acid batteries, paints, gasoline). Lead is a cumulative toxicant, and extensive use causes environmental contamination and health problems. The recommended limit for lead in drinking water is 10 ppb (WHO). Therefore, removal and recovery of Pb from industrial solutions is very important. In this study, the extraction chemistry of Pb from high acidic and high saline solutions are being studied. To achieve this, one goal is to produce Pb-212 tracer to determine the speciation of Pb in high acidic saline solutions. For this purpose, a lead generator system is developed based on the principle of mother-daughter relationship. In the first part, the thorium is separated from its daughters by using D2EHPA in benzene. After appropriate time, Ra-224 and its daughters are extracted from the organic phase with 0.1 M HNO₃ and loaded on an AG 50W-8X cation exchange column. The Pb-212 can subsequently be eluted quantitatively from the column with 1 M HNO₃.

Primary author: AVSAR, Deniz

Co-authors: Dr RASKOVIC-LOVRE, Zeljka (Former UiO); ERIKSEN, Dag Øistein (UiO); Prof. OMTVEDT, Jon Petter (UiO)

Presenter: AVSAR, Deniz

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