Application of SIMS to the study of selective deposition of trace amounts of lead and bismuth from solution onto the metals nickel and silver.

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The natural ^{238}U decay series includes the trio ^{210}Pb, ^{210}Bi and ^{210}Po. These are useful in estimating rates of environmental processes and ^{210}Po is a major contributor to the radiation dose of marine organisms. To develop an understanding of the distribution of these closely related radionuclides in the environment it is necessary to be able to measure all three. Accurate measurements depend on preliminary separation of the nuclides. Isolation and measurement of ^{210}Bi has been a continuing problem and this has restricted the study of the role of this nuclide in environmental processes. We have developed a sample preparation that includes plating polonium from solution onto a silver disc then plating bismuth onto a nickel disc and leaving the lead in solution. The ^{210}Bi is measured by Cerenkov counting. Any ^{210}Pb plating onto nickel with the bismuth would interfere in subsequent counting as it decays rapidly to ^{210}Bi.

We have used SIMS (Secondary Ion Mass Spectrometry) to measure bismuth and lead deposited on the nickel and silver discs. This is possible because the stable isotopes of the four elements do not overlap. SIMS is especially appropriate for this study as the Bi and Pb deposited as thin films on the metal surface. Careful selection of experimental conditions allowed quantitative measurements of lead and bismuth without mutual interference. The results have been used in developing plating conditions that optimise separation of lead and bismuth.