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The bottom part of the 238U chain, containing 210Pb, 210Bi and 210Po is difficult to detect. 210Pb emits low energy betas and a weak gamma (46.4 keV) with relatively low probability thus, gamma ray spectrometers have rather low sensitivity to that isotope (~Bq/kg). 210Bi and 210Po are practically pure beta and alpha emitters, respectively. Due to short ranges of alphas and betas the sensitivities of even large-surface spectrometers with respect to specific activities of Bi/Po are rather poor and reach in the best case about 50 mBq/kg (for 210Po in copper) [1].
Contamination of materials with 210Pb and its daughters is of special interest and concern for experiments looking for dark matter. Decays of 210Bi may spoil the low-energy parts of spectra of interest, and alphas emitted by 210Po may be a source of neutrons through the alpha-n reactions. Interaction of neutrons in an active part of a detector are hard to distinguish from interactions of dark matter particles, thus they pose a serious background source.
A new method to determine 210Po in various samples down to 0.5 mBq/kg (~50 ppt U equivalent) will be presented. It is based on radio-chemical separation of 210Po from the bulk material, followed by its deposition on a silver disc and counting of the activity with a low-background alpha spectrometer. To control the chemical yield for 210Po, 209Po is added as a tracer in each measurement. Blank runs are performed to determine contribution to the signal coming from the procedure. It defines the sensitivity of the method.
Several measurements were performed for metals (copper, lead, titanium, steel) and electronic components (resistors, capacitors, LED diode) to be used in signal readout systems of low-background detectors. The obtained specific activities varied form 10 mBq/kg (electroformed copper) up to some tens of Bq/kg for discrete electronic elements. Measuring 210Po in the same sample (batch) in a time sequence allows to determine its 210Pb content.

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