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Low-background radiochemistry techniques for extremely rare-event physics detector

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Radioanalytical chemistry methods and techniques have recently been widely involved in very low-level radioactivity measurements for physics experiments searching for extremely rare events. All experiments searching for events with elusive rates are bound by the unavoidable necessity to reduce to zero background levels and enlarge a target material to identify feeble signals. The need to minimize the background level while maximizing detector exposure leads to the pivotal importance of the implications of radioanalytical chemistry methods: radioassay of detector components and shielding materials at ultra-low levels, purification of target materials, and selective separation of interfering radioactive impurities, reduction of surface contamination, cooperation of extraction methods with the radioactivity counting methods, etc. In this work, the radioanalytical chemistry contribution to pioneering and leading physics experiments will be highlighted. The emphasis will be placed on solid-phase extraction (SPE) combined with ICP-MS, HPGe, NAA, etc. techniques applied to reach Th and U detection sensitivity at sub-ppt and ppq levels. The results of materials purification and radioassay obtained for AMoRE collaboration using the ICP-MS/SPE combination will be presented, along with a comparative summarization of the sensitivity achievements of other experimental groups.

Poster prize

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