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Th and U assessment in high-purity copper for low-background applications at CUP

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High-purity copper is an ideal material for constructing ultra-low background radiation measurement detectors. Experiments involving rare nuclear decay, such as neutrinoless double beta decay, and searches for dark matter often require construction materials with bulk and surface radioactivity levels below 10-12 g/g of Th/U level. Electroformed copper offers advantageous mechanical, electrical, and thermal properties, and it has an intrinsically low level of primordial radioisotopes, thorium (Th) and uranium (U). However, current experiments utilizing detector components made from high-purity electroformed copper face challenges due to surface contamination that occurs during the machining of the detector units. Many low-background experiments that use high-purity copper have indicated that this surface contamination becomes the primary source of background interference. Utilizing extractive chromatography sample preparation followed by ICP-MS detection at CUP, we developed a Th and U method assessment at 10-13 g/g of Th/U in bulk copper and at 10-12 g/g of Th/U in surface. With this technique, we tested the purity of various copper samples and the purity of the Cu surface produced with different machining methods, such as milling and threading. Also, the thickness of the contaminated surface was examined to perform a proper surface cleaning. The obtained results of our copper radiopurity campaign will be discussed in the presented talk.

Collaboration you are representing

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