

Removal of long-lived ^{222}Rn daughters by electropolishing thin layers of stainless steel

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Long-lived alpha and beta emitters in the Rn-222 decay chain on detector surfaces may be the limiting background in many experiments attempting to detect dark matter or neutrinoless double beta decay. Removal of tens of microns of material via electropolishing has been shown to be effective at removing radon daughters implanted into material surfaces. Some applications, however, require the removal of uniform and significantly smaller thicknesses. Here, we demonstrate that electropolishing < 1 micron from stainless steel plates efficiently reduces surface contamination. Examination of electropolished wires with a scanning electron microscope confirms that the thickness removed is reproducible and reasonably uniform. Together, these tests demonstrate the effectiveness of removal of radon daughters for a proposed low-radiation, multi-wire proportional chamber (the BetaCage), without compromising the screener's energy resolution. More generally, electropolishing thin layers of stainless steel may be an effective means of removing radon daughters without compromising precision-machined parts.

Summary

Primary author(s) : Prof. SCHNEE, Richard (Syracuse University)

Co-author(s) : Mr WHITE, James (Syracuse University); Ms MCCABE, Kelley (Syracuse University); Mr PEPIN, Mark (University of Minnesota); Mr BOWLES, Michael (Syracuse University); Prof. CUSHMAN, Prisca (University of Minnesota); Dr BUNKER, Raymond (Syracuse University); Prof. GUISEPPE, Vincente (University of South Dakota)

Presenter(s) : Prof. SCHNEE, Richard (Syracuse University)

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