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A review and outlook for the removal of radon-generated Po-210 surface contamination

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The next generation low-background detectors operating deep underground aim for unprecedented low levels of radioactive backgrounds.
The deposition and presence of radon progeny on detector surfaces is an added source of energetic background events.
In addition to limiting the detector material's radon exposure in order to reduce potential surface backgrounds, it is just as important to clean surfaces to remove inevitable contamination. Such studies of radon progeny removal have generally found that a form of etching is effective at removing some of the progeny (Bi and Pb), however more aggressive techniques, including electropolishing, have been shown to effectively remove the Po atoms. In the absence of an aggressive etch, a significant fraction of the Po atoms are believed to either remain behind on the surface or redeposit from the etching solution back onto the surface. We explore the chemical nature of the aqueous solution and an electrolytic cell potential to control the oxidation state of Po thereby maximizing the Po ions remaining in the etching solution of contaminated Cu surfaces. We present a review of the previous studies of surface radon progeny removal and our findings on the role of an electrolytic cell and Po oxidation in the preparation of a clean etching technique.

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