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Exploration of the challenges with radon-generated Po-210 surface contamination

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 and surrounding materials is an added source of energetic background events.
In addition to limiting the detector material's radon exposure to reduce potential surface backgrounds, it is just as important to understand the mechanisms for surfaces to attract Rn progeny and to clean surfaces to remove this inevitable contamination. Previous studies of radon progeny removal have generally found that some form of chemical cleaning can be effective at removing some of the progeny (Bi and Pb), however the ability to remove the more problematic Po atoms has had mixed results due to unfavorable chemical conditions and redeposition of Po atoms. We are studying several factors that determine and ultimately affect the presence of radon progeny contamination on clean material surfaces even after special cleaning and handling practices are utilized. We will present new findings on the dynamic competition that exists between the oxidation of Po atoms and substrate atoms during chemical etching, the limitations in removing Po atoms during chemical leaching of plastics, and the effect of electrostatics in attracting Rn progeny to clean surfaces.

Authors: CHRISTOFFERSON, Cabot-Ann (South Dakota School of Mines & Technology); ADAMS, F.M. (University of South Carolina); DUNTON, A.C. (University of South Carolina); GUISEPPE, Vincente (University of South Carolina)

Presenter: CHRISTOFFERSON, Cabot-Ann (South Dakota School of Mines & Technology)