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Modeling the Leaching of 222Rn Daughters into the SNO+ Detector

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SNO+ is a multi-purpose neutrino experiment which is located at SNOLAB in Sudbury, Ontario. Using 780 tonnes of organic liquid scintillator, SNO+ will search for neutrino-less double beta decay of 130Te. In addition, measuring low energy solar neutrinos are planned for the second phase. Looking for rare events requires very stringent background limits. One of the sources originates from 222Rn daughters implanted into the inner surface of the acrylic vessel (AV). Rn decays to 210Pb which has a relatively long half-life (22 years). Subsequently 210Pb decays by beta emission to 210Bi, and 210Po which are backgrounds for the experiment. Rn daughters can leach into the detector volume, therefore it is important to study the leaching kinetics and its dependence on factors such as temperature, leaching medium and initial conditions. Several bench-top measurements were performed on the leaching rate of 210Pb and 210Po into different mediums. I developed a model based on diffusion physics, which can be used to fit the data and estimate expected background rates from this source for the SNO+ experiment.

In January, 2015 an underground water assay was performed on the water which has been contained in the AV for three months. The specific activity in the water was calculated as 0.150(+0.118/-0.058)Bq/mˆ3 which matches the measured value of 0.26 (+−0.04) Bq/mˆ3
. This presentation
will discuss the leaching model and compare the results with the bench-top measurements.

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