

SNO-STR-93-001

Radon Emanation from Urylon 201-15FR

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A large 0.125 inch thick (total area of 0.49 m²) piece of Urylon 201-15FR (72% relative humidity) was received. A razor blade was used to cut it up into three small pieces and the pieces were wiped clean with ethyl alcohol on a Kimwipe towel. There were black scuff marks on one piece which did not come off.

The three pieces were put into emanation chamber #3 (all acrylic with a teflon O-ring seal) and pumped for a total of 22.5 hours with a liquid-nitrogen trapped oil roughing pump over a period of three days. The ultimate pressure reached in the chamber was 178 microns (0.18 Torr) as compared to 75 microns for the empty emanation chamber.

The Urylon was allowed to emanate for three days before the radon was extracted. The pressure in the emanation chamber rose to about 1000 micron over the three days. During radon extraction the pressure in the small trap went up to about +15 psi when it was warmed which indicates there was some volatile gas trapped. This is similar to what happened for another sample of Urylon measured earlier. The volatile in that case was due to the paraffin used as a release agent. The amount of volatile is much lower in this present sample.

There was 512±23 counts observed after one day of counting. The background of the empty emanation chamber radon board and ZnS cell was measured to be 11±3 counts in one day. Hence the net counts due to radon from the Urylon is 500 counts in one day. Taking a detection efficiency of 66% for the cell, 3 alphas per radon decay, a transfer efficiency of 75% from the emanation chamber to the small trap, a transfer efficiency of 66% from the small trap to the ZnS cell and allowing a correction factor for emanation of 3 days gives:

1220±56 radon emanated per day from the Urylon.

Using a total area of 0.49 m² (both sides) implies an emanation rate of 103±5 Rn m⁻²hr⁻¹.

The Urylon was allowed to emanate another 4 days and the radon was extracted. There were 617±25 counts in one day of counting. This corresponds to 1227±49 radon emanated per day from the Urylon or 104±4 Rn m⁻²hr⁻¹.

We are seeing radon from the Urylon well above the apparatus background. This radon may be coming from the molecular sieve or fire-retardant used in the Urylon (Guelph has gamma-counted the molecular sieve paste). The above measured emanation rate can be compared to the design goal of about 10 Rn m⁻²hr⁻¹ for the liner. This can also be compared to the 2 × 10⁷ Rn m⁻²hr⁻¹ from the bare norite rock.

The results suggest that Urylon 201-15FR is not suitable for the 0.05 inch layer that goes on top of the 0.2 inch thick HH453 Urylon liner.