

Uraniferous Granites Characterized by their Radon Exhalation

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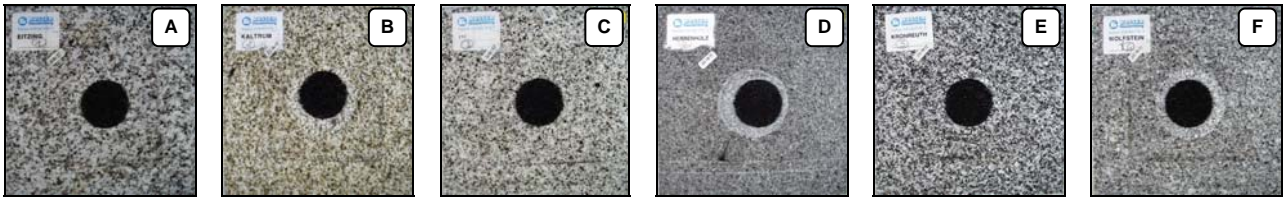
Problem: Polishable granites are often used as floor materials. Their well-known uranium content may cause measurable radon exhalation and surface contamination. This was considered intolerable for the large Experimental Hall of the Neutron Research Reactor FRM II.



Granite quarries Eitzing (A) and Kaltrum (B), greyish (C) and brownish (D) granite from Kaltrum

Methods: Standard size slabs of 20 x 20 x 3 cm³ and fine grained charcoal were enclosed in radon gastight foil. The total activity expressed in Bq EER (equilibrium equivalent radon) collected in the charcoal is called the Radon Index R.

Index Q gives gammaspectrometric ratios of Pb-214 to Pb-212, resp. Rn-222 to Rn-220 or U-238 to Th-232.



Granite slabs from quarries A to F, with charcoal collector within gastight foil

Results: Granites from 6 quarries A to F around Hauzenberg/Passau differ insignificantly in their total activity, as measured by gamma spectrometry in uncalibrated slab geometry.

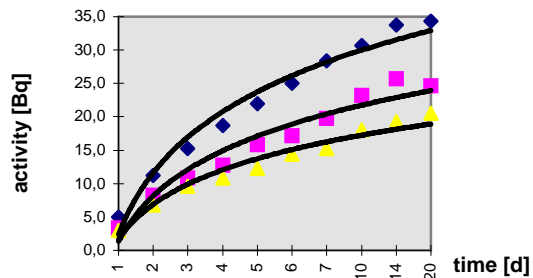
Significant differences show up in the Indices R and Q:

Index / Quarry	A	B	C	D	E	F
Q	2.0	3.1	3.5	1.8	1.5	1.8
R	3	24	23	4	4	7

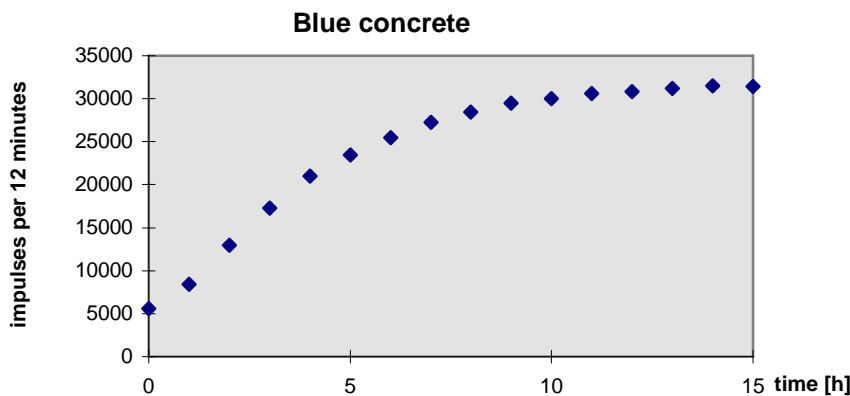
Table 1: Values of Radon Index R and chemical Index Q for granites from 6 quarries A to F

- Discussion:**
- The much higher radon exhalation of group I granites (B and C) cannot be explained by the chemical difference of higher U/Th ratio alone (Index Q), as compared to group II granites (A, D, E, F). There must be a second difference, a physical one, to enhance exhalation, namely microcracks. This is supported by the more yellowish-brownish coloration of group I granites, due to metasomatic alteration, as compared to the whitish-greyish coloration of group II.
 - Other granites from Eastern Bavaria of much stronger brownish coloration have R values up to 90.
 - Granites need ten days for steady state exhalation as compared to one day for „blue concrete“, a building material of high porosity and very high R values, formerly produced in Sweden, using kolm, a uraniferous alumn shale.

Time [d]	Granite A	Granite B	Granite C
1	5.0	3.4	3.0
2	11.2	8.2	6.8
3	15.2	10.8	9.6
4	18.7	12.8	10.8
5	22.0	15.8	12.3
6	25.0	17.2	14.4
7	28.4	19.8	15.2
10	30.7	23.2	18.0
14	33.8	25.7	19.3
20	37.2	24.6	20.5



Granites from Eastern Bavaria



Time [h]	Blue concrete
0	5603
1	8399
2	12954
3	17260
4	21033
5	23459
6	25465
7	27282
8	28436
9	29461
10	30029
11	30633
12	30825
13	31166
14	31491
15	31433

Accumulated radon exhalation vs time for dense granites and porous blue concrete, reaching steady state in 14 days (granites) respectively 1 day (blue concrete)