Particle concentrations and radon equilibrium ratios in an occupied auditorium

I. Bilska[1], M.R. Dudzinska[1], K. Kozak[2], J. Mazur[2] and B. Polednik[1]

[1]Faculty of Environmental Engineering , Lublin University of Technology, Lublin, 20-618, Poland
[2] Institute of Nuclear Physics PAN, Krakow, 31-342, Poland
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Presenting author's email: i.bilska@wis.pol.lublin.pl

Indoor air quality is mostly assessed on the basis of its thermal parameters, chemical components and aerosol concentrations. These factors significantly affect the subjective comfort. Radon (^{222}Rn) concentration levels are also very important (Kozak et al., 2012). This sensible imperceptible radioactive gas and its radioactive solid decay products can pose harmful health effects (Machaj and Urbański, 2004).

The aim of the study was to determine aerosol particle, radon and radon decay product concentrations in occupied and unoccupied auditorium.

Measurements were conducted in air-conditioned auditorium of Environmental Engineering Faculty in Lublin University of Technology. The room can accommodate up to 200 people. It is equipped with a system to control indoor air parameters e.g. relative humidity, temperature and CO_2 concentration.

Continuous measurements of radon (^{222}Rn) concentrations (conducted with students' presence and their absence) were performed with the use of AlphaGUARD PQ2000 (Genitron). Concentrations of radon decay products were measured using EQF3220 (SARAD). DUSTRAK DRX 8533, OPS 3330 and P-Trak 8525 (TSI Inc.) were used to measure indoor particle mass and number concentrations.

Figure 1 shows radon, its decay product concentration changes and values of equilibrium ratio in the occupied and unoccupied auditorium. The equilibrium ratio (ER) was calculated from the following Equation :

$$ER = \frac{EEC_{Rn}}{C_{Rn}} \qquad (1)$$

where EEC_{Rn} is effective equivalent concentration of short-lived radon decay products (Bq/m^3) and C_{Rn} is radon concentration (Bq/m^3).

It is observed that radon and its decay products concentrations and ER values were significantly depended on the students' presence and the air exchanged rate in the monitored auditorium.

Figure 2 shows the relation between radon and aerosol particle concentrations.

The obtained results confirm the importance of the aerosol particle concentrations and the air exchange rates in the assessments and evaluations of the indoor air quality. The results also indicated the significance of such parameters while decreasing the radon-related health risk in air-conditioned premises.

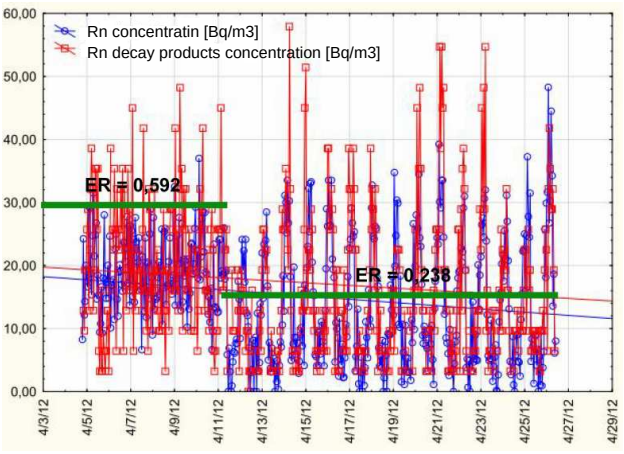

Figure 1. Radon equilibrium ratio values in occupied and unoccupied auditorium.

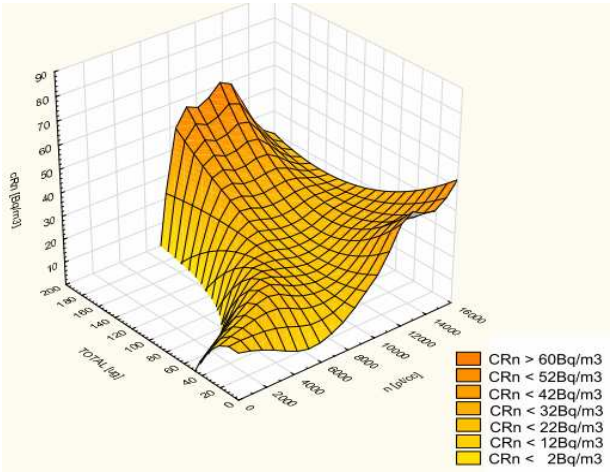

Figure 2. Radon concentration vs. particle mass and number concentrations.

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Kozak K., Dudzińska M. R., Mazur J., Połednik B., Grzadziel D. (2012) *Radon exposures in premises in the Lublin region, eastern Poland*, Healthy Buildings 2012.

Machaj B. and Urbański P. (2004) Influence of aerosol concentration and multivariate processing on the indication of radon progeny concentration in air, *Nukleonika*, **49(3)**, 123-129.