MEASUREMENTS OF RADON ENTRY PARAMETERS IN THE BUILDINGS

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It is well known that the radon and its decay products are responsible for about half the total population dose from natural sources of ionizing radiation. It is proved that radon is the second cause of lung cancer initiation after the smoking. Radon concentration depends on the radon entry rate and air exchange in the buildings and significantly higher in the indoor atmosphere compared to outdoor.

In this presentation the mechanisms of radon entry in the buildings are examined in detail. The purpose of this analysis is development of the method for estimation of radon entry mechanisms and determination the critical parameters describing these processes.

The experimental technique of the assessment of radon entry rate and air exchange rate in the room is developed and experimentally verified. The technique is based on the analysis of time series of radon concentration under active and steady-state conditions of room use. For assessing the radon entry rate and air exchange rate in the room it is proposed to use for analysis the entire curve of radon accumulation, not only the value of radon concentration at the end of exposure. A series of measurements of radon concentration is described by nonlinear mathematical regression, characterized by the accumulation of radon in a room in steady-state condition of room use.

Fig. 1. Typical radon concentration time series

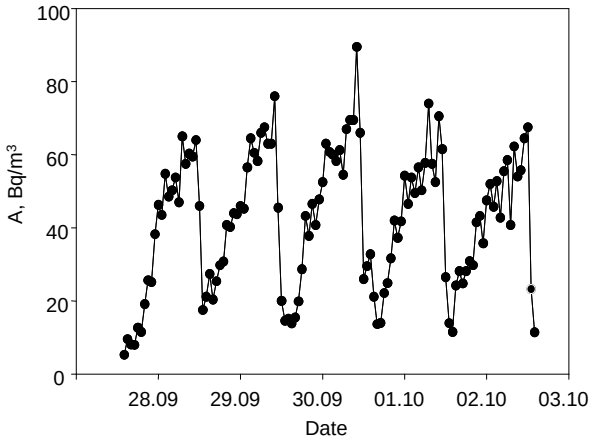
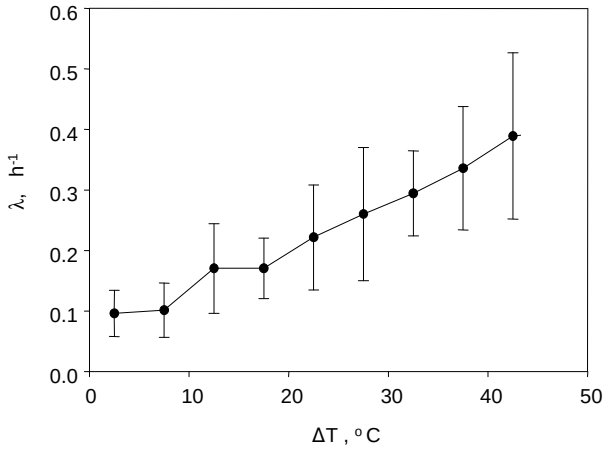


Fig. 2. Dependence of ventilation rate on the temperature difference



Dependence of radon entry rate on temperature difference ΔT between indoor and outdoor atmosphere

Fig. 3. In case of predominant of diffusion mechanism

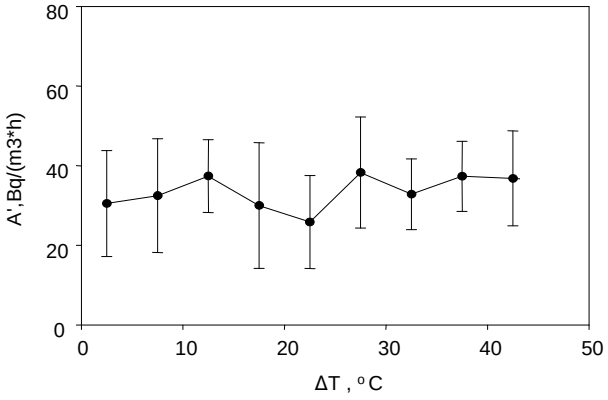


Fig. 4. In case of predominant of advection mechanism

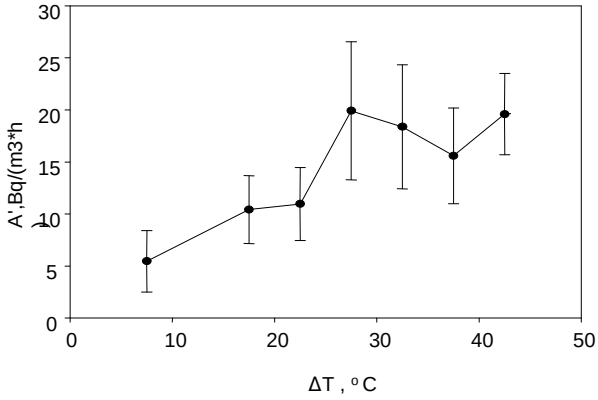
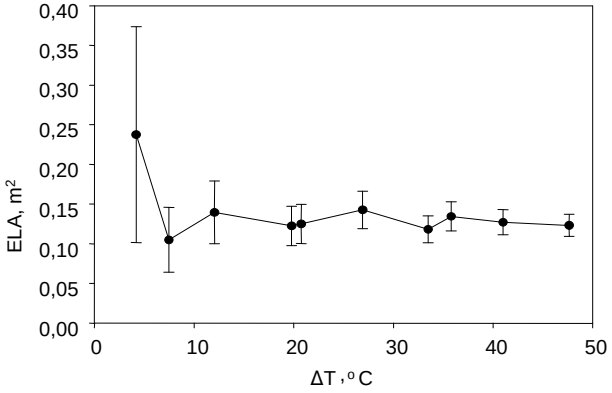


Fig. 5. Dependence of the effective leakage area on the temperature difference between the building envelope and the outdoor atmosphere



Conclusion

The experimental technique of the assessment of radon entry rate and air exchange rate in the room is developed and experimentally verified. It is demonstrated that the study of dependence of radon entry rate on temperature difference ΔT between indoor and outdoor atmosphere allows to estimate the dominant radon entry mechanism – diffusion mechanism (absence of the dependence on ΔT) or convective (Rn entry rate increase at ΔT increase). It is shown that simultaneous measurements of time series of radon concentration and pressure difference between building envelope and outdoor atmosphere allow assessing such room parameter as Effective Leakage Area.