Building upon the knowledge developed in this thesis, measurements of radon release from concrete might also be used to obtain information about the condition of concrete in constructions. Within the concept of **sustainable development** the durability of concrete constructions becomes increasingly important [1]. In most instances it is still *a priori* unknown over which time span concrete construction elements keep their fundamental properties needed to preserve the integrity of the construction. *In situ* monitoring of parameters that are associated with these properties is often used to obtain information on the actual condition of the concrete. Especially in cases of large constructions like, tunnels, underground parking facilities, bridges, hydroelectric dams etc, a decision for replacement or remediation will have a huge economical impact. Furthermore, for most of these constructions, undetected damage will result in a significant risk for human safety. *In situ* condition assessment of concrete should therefore be very reliable.

Recently, the properties of near-surface concrete (cover-zone concrete; covercrete) have been identified as being essential for assessment of durability [2, 3]. Near-surface concrete actually is the first line of defence against attack by deterioration mechanisms such as, chloride ingress, carbonation, freezing and thawing, alkali-silica reactions etc. Consequently, changes in the cover-zone concrete are the first indication of possible failure of the construction. Most of the deterioration mechanisms are controlled by the rate at which deleterious substances can enter the concrete [4]. Information on the transport properties of the near-surface concrete is thus essential to estimate the remaining service life of the structure.

Both the generation and the transport of radon in concrete are intrinsically related to the concrete (micro)structure. Consequently, the amount of radon that exhales from a certain area of the surface of a concrete structure is a telltale of the condition inside the structure. Moreover, due to the limited half-life of radon (3.8 days) only radon that originates from the near-surface zone will have the possibility to reach (by diffusion, advection etc.) the surface of the concrete construction. Radon exhalation monitoring is thus especially suitable to assess the condition of cover-zone concrete.

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