



## **Radon as an Anthropogenic Indoor Air Pollutant**

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Radon is generally regarded as a naturally occurring radiological hazard but we report here measurements of significant, hazardous radon concentrations that arise from man-made sources, including granite ornaments/artefacts, uranium glass and glazed objects as well radium dial watches. This presentation concerns an examination and assessment of health risks from radium and uranium found in historical artefacts, many of which were once viewed as everyday items, and the radon that emanates from them. Such objects were very popular in industrialised countries such as the USA, UK and European countries) particularly between and including the two World Wars but are still readily available.

A watch collection examined gave rise to a hazardous radon concentration of  $13.24 \text{ kBq}\cdot\text{m}^{-3}$  approximately 67 times the Domestic Action Level of  $200 \text{ Bq}\cdot\text{m}^{-3}$ . The results for an aircraft altimeter are comparable to those of the watches, indicating radon activity equivalent to several watches, and also indicate an equilibrium concentration in the  $16.3 \text{ m}^3$  room ca. 33 times the UK domestic Action Level. Results from a granite block indicate a radon emanation of  $19.7 \text{ Bq}\cdot\text{kg}^{-1}$ , but the indicated equilibrium concentration in the  $16.3 \text{ m}^3$  room is only ca. 1.7% of the UK domestic Action Level. Uranium-glazed crockery and green uranium glass were scoped for radon activity. The former yielded a radon concentration of ca.  $44 \text{ Bq}\cdot\text{m}^{-3}$  in a small (7 L) sealed container. The latter yielded a lower radon concentration in a larger (125 L) sealed container of ca.  $6 \text{ Bq}\cdot\text{m}^{-3}$ . This is barely above the background radon concentration in the laboratory, which was typically ca.  $1\text{-}2 \text{ Bq}\cdot\text{m}^{-3}$ .

Individual items then are capable of giving rise to radon concentrations in excess of the UK Domestic Action Level in rooms in houses, particularly if poorly ventilated. We highlight the gap in the remediation protocols, which are focused on preventing radon entering buildings from outside, with regard to internally-generated radon hazards. We conclude with a recommendation that radon as arising from artefacts and ornaments is considered appropriately in radon protocols and guidelines.