Development of Protocols to Improve Accuracy of Radon Concentration Measurement

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Radon is a naturally occurring radioactive material; inhalation of this gas is thought to be associated with at least 1000 lung cancer related deaths annually in the UK alone (1). Thus accurate home and workplace radon monitoring is important in many areas of the UK; hence radon assessment is routinely conducted in buildings situated in areas of known risk. Radon concentration is usually monitored using small plastic detectors, solid state nuclear track detectors (SSNTD); alpha particles, from the breakdown of radon, cause tiny indentations (tracks) in the plastic which can be etched to enable microscope imaging. Radon measurement laboratories currently use 2D imaging to assess SSNTDs. Using 3D confocal microscopy, we have previously observed that some tracks coalesce (2, 3) which could be difficult to analyse using 2D imaging alone. A further unknown with current SSNTD assessment is the degree to which etching may prevent visualising adjacent tracks. There is a possibility that etching could result in some tracks being subsumed in other tracks. On the other hand if there is too little etching track sizes would be reduced and hence could be more difficult to image; thus there is a balance required to obtain suitable measurement accuracy. The aims of this project are to develop improved radon measurement protocols and instrumentation.

The project will involve comparing 2D and 3D microscope imaging of SSNTDs as well as assessing the most appropriate etching procedures; detectors from field measurements as well as specific experimental tests will be examined. Thus test chambers will be developed and applied in order to compare different detector processing protocols as well as imaging methodologies. The measurement techniques will be compared with existing measurement techniques.

References

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