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Analysis and 3D visualisation of tracks in Solid state Nuclear Track Detectors

David Wertheim (1), Gavin Gillmore (2), Louise Brown (3), and Nick Petford (4)

(1) Kingston University, Faculty of Computing, Information Systems and Mathematics, Kingston upon Thames, United Kingdom (d.wertheim@kingston.ac.uk), (2) Kingston University, Faculty of Science, Kingston upon Thames, United Kingdom , (3) Advanced Engineered Materials Group, National Physical Laboratory, Teddington, Middlesex, UK, (4) Northampton University, UK.

Radon gas inhalation is believed to be the cause of about 1100 lung cancer related deaths annually in the UK (1). Radon concentrations can be monitored using Solid State Nuclear Track Detectors (SSNTDs); the natural decay of radon results in alpha particles which form tracks in the detectors and these tracks can be etched in order to enable microscopic analysis. We have previously shown that confocal microscopy can be used for 3D visualisation of etched SSNTDs (2, 3). The aim of the study was to develop and apply methods to further analyse track angles in SSNTDs. A 'LEXT' OLS3100 confocal laser scanning microscope (Olympus Corporation, Japan) was used to acquire 3D image datasets of CR-39 plastic SSNTDs. The data were exported both as images and also spreadsheet files with height data. Software was written in MATLAB (The MathWorks Inc., USA) in order to analyse the height data. A simple measure of track angle was obtained, from depth profiles, by drawing a straight line from a point on the detector immediately adjacent to the track to the deepest point of the track. 3D visualisations were analysed by eye and inclination angles assessed on eight tracks. The angles were quantified from depth profiles obtained using the 'LEXT' software and software developed with MATLAB. Depth profiles together with 3D visualisations and can help in clarifying images of coalescing tracks. The technique enables track angles to be quantified for both single and coalescing multiple tracks. This could assist in studying variation in track appearance and possible causes. The observed track inclination angles may help to assess the angle at which alpha particles hit the detector.

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