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Application of microCT in geosciences: geochemistry

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Soils within the vicinity of Vaalputs radioactive waste disposal facility show complex system of chemical and morphological characteristics hosted within a thick dorbank (duricrust) horizon. Many regions within the dorbank horizon are dissected vertically and horizontally by highly laminated vein structures. These veins form between macro peds of the polygonally divided dorbank along possible desiccation cracks. Analyses of the laminated veins indicate alternating layers of calcite and amorphous silica. Adjacent to the laminated veins within the dorbank horizons are sporadic yet high barite (BaSO4) concentrations. These barite concentrations were identified using x ray fluorescence (XRF) technique. The distribution and elemental associations were later confirmed using imaging techniques including micro CT, PIXE and SEM. The application of micro CT allowed a whole rock visualisation and the distribution of mineral barite within the rock which then revealed interconnected micro vein structures of barite. This indicates that the accumulation of Ba may have occurred under high sulphide soil climates and later the crystallisation of mineral barite appears to have occurred under progressive drying and sulphate enriched soil climates.

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