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## Characterizing the unusual 3D morphology of calcite minerals found in coal: a case study

### Content

Although there has been a shift towards cleaner energy production (e.g. biomass and solar), these energy sources won't entirely replace fossil fuels in the near future. Thus, low grade coal will remain the dominant contributor to the South African power grid for the foreseeable future. Such coals have abundant mineral matter that causes complications during coal utilization. This case study aimed to characterize the chemistry, mode of occurrence and formation of minerals in a sub-bituminous coal sample. X-ray micro-computed tomography (CT) contrasts caused the minerals to appear brighter (i.e. denser) than the surrounding matter and similar greyscale variations were also observed with Scanning Electron Microscopy (SEM) imaging. The non-destructive ability of X-ray CT provided 3D visualization of the minerals' morphology which led to the identification of unusual star-shaped minerals. Energy-dispersive X-ray spectroscopy (EDS/EDX) analysis classified the star-shaped minerals as calcite. Although it's rare, biogenic processes can form carbonate minerals in coal which led to noticing the resemblance between the mineralogical structure of the calcite star-shaped minerals and that of calcareous sponge spicules.

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