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Electron Backscatter Diffraction (EBSD) analysis of fossil turtle eggshell

Electron Backscatter Diffraction (EBSD) allows high-resolution analysis of the microstructure of fossilized turtle eggshell. EBSD is routinely used in materials science; however, it has only recently been applied to study fossil and modern eggshell. This technique was used to study the microstructure of fossilized turtle eggs from the Upper Cretaceous Kaiparowits Formation of Utah. The fossil sample was cut radially and micro-polished for mapping. The sample was cut radially and micro-polished for mapping and was first studied with cathodoluminescence, where diagenesis/replacement appeared to be focused within the pores. The crystal orientation and mineralogy (calcite vs. aragonite) of the eggshell were identified using the pixel data from EBSD mapping and displayed in maps and stereographic pole figures to show the preferred orientation and spatial arrangement of individual crystals. Details of the aragonite eggshell structure, including preferred orientation, misorientation between adjacent shell units, lattice distortions and subgrain structure, were then observed and quantified. This technique could be applied for morphological and diagenetic studies of fossilized and modern eggshell.