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Applications of Electron Backscatter Diffraction on Fossilized Dinosaur and Modern Eggshell

The use of electron backscatter diffraction on eggs takes a material science approach to the field of paleontology. This technique provides high resolution data on crystallographic orientation and has recently been used to analyze the crystallography of fossilized and modern eggshell. Eggshell microstructure was examined for dinosaur eggs from the Cretaceous Tiantai Basin of Zhejiang Province, China, as well as modern avian eggs. The samples used in this study were radially cut and micro-polished for mapping. They were initially studied under a petrographic microscope and cathode luminescence to determine minimal effects of diagenesis. The EBSD detection on a scanning electron microscope was used to map the average orientation of the crystals pixel by pixel, producing maps and stereographic pole figures. The details of the calcite and aragonite structure of the eggshells, (i.e., preferred orientation, misorientation between adjacent shell units, lattice distortions, and sub-grain structure) were quantified. Avian eggshell will be mapped in order to compare the structure to the fossilized dinosaur eggshell, thereby showing morphologic differences with the aim of determining potential biological implications. The approach of electron backscatter diffraction provides high resolution, quantitative data on the internal microstructure of fossilized and modern eggshell which could be used for future morphological studies.