

Speciation and distribution of sulfur in a mollusk shell as revealed by in situ maps using X-ray absorption near-edge structure (XANES) spectroscopy at the S K-edge

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ABSTRACT

The microstructure and composition, including chemical speciation of S, of the calcitic and aragonitic shell layers of two mollusk shells were investigated using a combination of thermogravimetric analyses, scanning electron microscopy, electron probe microanalyses, and X-ray absorption near-edge structure spectroscopy. Microprobe analyses show the different chemical contents of the shell layers, whereas in situ XANES maps and spectra show the dominance of organic sulfate over S aminoacids (cysteine, cystine, and methionine). Also, the distribution of S species is different for different structures within the shell. Growth lines are clearly seen in the chemical species maps. These results suggest that studies focussing exclusively on the protein contents of biominerals are not sufficient to understand the role of the organic matrices in the biomineralization and diagenetic processes.