

Aragonite and the fossil record: are we overlooking something?

Uwe Balthasar

Plymouth University, School of Geography, Earth and Environmental Sciences, Plymouth, United Kingdom
(uwe.balthasar@plymouth.ac.uk)

Aragonite and calcite are the two most common minerals from which marine organisms secrete their skeletons, yet their potential to preserve in the fossil record is very different. While calcite is generally very stable, aragonite dissolves relatively easily either during diagenesis or even pre-burial. While the complete loss of aragonitic shells is generally acknowledged, the original contribution of aragonite to commonly preserved calcareous fossils is generally overlooked, particularly in groups with no recent representatives. Palaeozoic brachiopods and stromatoporoid sponges, for example, are traditionally considered to have been made of calcite. However, EBSD work on stromatoporoids shows a complex early diagenesis during which the skeletal walls recrystallised first and served as the nucleation surface for the cements infilling the open galleries between the walls. This suggests that the original mineral composition of the skeletal walls had a high diagenetic potential which makes a stable low-magnesium calcite composition unlikely. Equally, the biggest subphylum of brachiopods, Rhynchonelliformea, is traditionally considered to have shells that are exclusively made of low-magnesium calcite. However, a survey of the shell thickness of 176 Ordovician-Silurian brachiopod valves reveals that the calcitic remains of some of the larger shells (particularly of pentamerids) are far too thin with several specimens exhibiting the irregular internal margins typical of dissolution, thus suggesting a bimineralic composition with an outer calcite and an inner aragonite layer. These examples indicate that existing estimates of Phanerozoic aragonite and calcite skeletal mineralogy are not only biased by the complete dissolution of shells, but we probably overestimate the abundance of original calcite composition in the fossil record.