Biodiagenesis of Modern Siliceous Sponges (The Bahamas) and the Origin of Early Jurassic Sponge Mounds (Central High Atlas, Morocco)

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Phanerozoic shelf carbonate sediments display vast amounts of calcified siliceous sponges. From textural analyses of these spongiolithic rocks it is evident that siliceous sponge calcification must be related to a sponge-specific pathway of (bio-)diagenesis. Calcification occurred syn-vivo to early postmortem and preserved a number of details of the soft tissue organisation of sponges. Understanding the calcification of siliceous sponges is fundamental in order to assess the accretionary and diagenetic mechanisms of ancient sponge carbonate mounds. This paper presents a comparison of a modern calcifying siliceous sponge (Spheciospongia vesparium, Great Bahama Bank) with ancient calcified sponge materials that are present in Early Jurassic (Late Sinemurian) sponge mounds of the central High Atlas, Morocco. We consider organic colloids to be involved in the calcification (aragonite) of the modern sponge. Calcification goes along with sponge tissue degradation under shallow burial conditions within the sediment. Electron microscopy and in-situ fluorescence microspectometry studies indicate that organic colloids attach onto a proteinacous network (sorption) that developed due to the dismantling of the collagen tissue. Bacteria and other microorganisms support sponge tissue degradation, but neither act as a substrate for mineral precipitation or are present in significant numbers at calcification sites. This process of early calcification may explain the origin of the fossil calcified siliceous sponges, thereby attributing a mineral-producing taphonomy as the primary control for the development of Early Jurassic sponge carbonate mounds.