Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5688

Dissolution and Authigenic Precipitation Among Biogenic Silica Types

REBECCA A PICKERING[1], DANIEL J. CONLEY[2] AND JEFFREY W KRAUSE[3,4]

[1]Lund University

[2]Department of Geology, Lund University

[3]Dauphin Island Sea Lab

[4]University of South Alabama

Presenting Author: rebecca.pickering@geol.lu.se

The oceanic delivery of dissolved silicic acid and burial of biogenic silica ($bSiO_2$) are dominated by processes occurring in coastal systems. Recently, authigenic clay neoformation has been shown to be an important sink of reactive Si and other elements (e.g., Fe, Al, K) in these systems, with the global burial of Si exceeding the combined burial of $bSiO_2$ in the Southern Ocean and oligotrophic gyres. There is a link between the precipitation of authigenic products in sediments and the presence of $bSiO_2$ which acts as not only a critical substrate for formation, but also a necessary reactive component (e.g. Si source). To better constrain the mechanisms regulating this process, we examined authigenic products formed during batch experiments using different $bSiO_2$ materials from three distinct siliceous phyla (i.e., diatom, sponge, phytolith) and a crystalline quartz control. Each was allowed to react in fluid suspensions for 20 months with or without natural purified clays, separated by a dialysis membrane. Fluid chemistries monitored over the course of the experiment are presented here in addition to results from solid phase analyses. Using sequential leaching methods refined for deltaic sediments, we show that all $bSiO_2$ types can accommodate authigenic coating formation. There was a clear increase in bulk analysis of the particulate Si pool associated with early diagenetic products (e.g. metal oxides) for phytoliths and sponges with the clay treatments, suggesting a detrital dissolution and reprecipitation pathway. Unexpectedly, the final operational pool silica per gram associated with the sponge increased an order of magnitude relative to the original material. This study provides new insights into the factors leading to increased phytolith and sponge $bSiO_2$ preservation in coastal systems and their potential role for facilitating authigenic product formation during early diagenesis.