

## **The application of phytolith stratigraphy to ‘barren’ red-beds**

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Significant oil and gas reserves occur in so-called “barren red-beds” in several regions around the world, throughout the geological timescale, such as in the Late Carboniferous, Permian and Early Triassic of Europe and in the Permo-Carboniferous of the Middle East. These sediments are generally deposited in non-marine environments under arid climate conditions. In terrestrial basins, biostratigraphic analysis based on pollen and spores is often effective in constraining geological models. Unfortunately, such organic-walled microfossils are not preserved in red-bed deposits due to oxidation, hampering stratigraphic correlation on field and regional scale.

In our research, a group of biogenic siliceous microfossils, termed phytoliths, or biogenic silica particles (BSPs), has been applied as biostratigraphic tool in the Permo-Carboniferous red-bed sequences.

The first steps toward applicable fossil phytolith taxonomy have been established. Encouraging results are obtained in the Permian Upper Rotliegend Formation in the Groningen gas field, the Netherlands, from Permo-Carboniferous Unayzah Group in Saudi Arabia and from Oligocene deposits of South America.

While further studies are needed to evaluate the coupling of the BSPs to parent plants for palaeoenvironmental interpretation, to increase the stratigraphic resolution and to establish a high-resolution regional standard stratigraphy, strong evidence suggests that BSPs have potential to provide the basis for better stratigraphic correlations in “barren” deposits. In principle, the application of BSPs can be extended to any other geological time period with “barren” deposits.