

Reconstructing the original biogeochemistry of organic microfossils requires quantifying the extent of the chemical transformations they experienced during burial and maturation processes. Two distinct stages of evolution with temperature are observed: in a first stage, sporopollenin experiences dehydrogenation and deoxygenation simultaneously (below 500 °C); in a second stage (above 500 °C) an increasing concentration in aromatic groups and a lateral growth of aromatic layers are observed. With increasing heating duration (up to 900 min) at a constant temperature (360 °C), oxygen is progressively lost and conjugated carbon–carbon chains or domains grow progressively, following a log–linear kinetic behavior. Yet, performing such laboratory experiments provides key insights on the processes transforming biogenic molecules into molecular fossils.