

On the morphology and chemistry of (micro)fossils: Matches, mismatches and kerogen formation

JAN W. DE LEEUW^{1,2}

¹NIOZ Royal Netherlands Institute for Sea Research, P.O. Box 59, 1790 AB Den Burg-Texel, The Netherlands.
(jan.de.leeuw@nioz.nl)

²Utrecht University, Depts of Earth Sciences and Biology, Budapestlaan 4, 3584 CD Utrecht, The Netherlands.

The far greater part of organic matter on Earth is present in sediments and consists of high molecular weight, insoluble constituents collectively known as kerogen. To improve our understanding of the origin, chemistry and fate of this kerogen, morphologically well preserved organic (micro)fossils and their extant counterparts are studied assuming that the preservation of such fossils is a consequence of the resistance towards (bio)degradation of the organic constituents they are made of.

Many investigations of well-preserved (micro)fossils and laboratory experiments with their extant counterparts using pyrolytic, chemical and spectroscopic analytical approaches do indeed indicate that biopolymers such as algaenan in algae, cutan in plant cuticles and lignin in wood are resistant towards diagenesis and may thus be responsible for excellent fossil preservation.

However, this “match” of preserved biochemistry and morphology is not always encountered. In many well-preserved fossil algal cells and plant cuticles and their extant counterparts these resistant biomacromolecules, algaenan and cutan resp., are completely absent. Recent studies seem to indicate that the excellent preservation of such fossils is due to a gradual replacement of originally present labile bio(macro)molecules by newly formed highly resistant geomacromolecules without significant morphological changes, a “mismatch” between biochemistry and morphology. In particular studies of sporopollenin in extant and fossil macro- and microspores indicate that pre- or post depositional exposure of organic entities to oxygen triggers oxidative cross linking of “nearby” low molecular weight (poly)unsaturated membrane lipids resulting in resistant, mainly aliphatic geopolymers partly or completely replacing the original biopolymers.

This kind of (micro)fossil studies is crucial to unravel the molecular structure of kerogen and, consequently, to understand the molecular chemistry of fossil fuel genesis.

Origin of karstic dissolution voids in Jurassic shallow marine carbonates at SW of Ankara, (Turkey)

ARIF DELIKAN AND HÜKMÜ ORHAN

Selçuk Üniv. Müh. Mim. Fak. Jeoloji Müh. Bölümü Konya, Türkiye (adeli@selcuk.edu.tr, horhan@selcuk.edu.tr)

Jurassic rocks cropping out at the southwest of Ankara (Turkey) rest unconformably on the basement rocks commonly as microbial deposits but also as detrital sediments. Karstification occurs in shallow marine biomicrite bearing sponge spicules as well as in microbial carbonates. Most of the cavities in the carbonates developed when they were carried to subaerial conditions as a result of sea level changes and, also by tectonic activities. Karstic voids are irregular in shape and disconnected. Their fillings are initiated with more than one crystallization phase of low-magnesian calcite with different colors [1]. Following this coating crystallization phase, the remaining voids were filled by different type of sediments. These infilling sediments are generally laminated, pink, or in different color.

They are vadose silts in varying size, but in some cases, comprises grains derived from host rocks. Compared to others, some karstic cavities are large. They were interpreted as being formed following fracturings in relation with tectonic activities. These cavities commonly were filled by marine sediments. Being coated by calcite crystals implies that these cavities were inundated by marine water having adequate condition for calcite crystallization before filling by marine sediments. Lamination of fine filling sediments is commonly parallel to the parent rocks. But fillings of cavities in a 12 cm thick layer have laminated sets which are neither parallel to each other nor to the bedding of parent rocks. This shows that the basement of the basin was not stable and, was tilted differently in time.

[1] Jimenez de Cisneros, C., Mas, J.R. and Vera, J.A, (1991) *Sedimentary Geology* **73** 191-208.