Preservation and characterization of exopolymeric substances (EPS) in subsurface estuarine sediments

Thibault Duteil[1,*], Raphael Bourillot[1], Olivier Braissant[2], Brian Gregoire[3], Maud Leloup[3], Adrien Henry[1], Benjamin Brigaud[4], Eric Portier[5], Hugues Féniès[1], Isabelle Svahn[6] and Pieter T. Visscher[7]

[1]Georessources & Environnement, Bordeaux INP, Univ. of Bordeaux Montaigne, France
[2]Center for Biomechanics and Biocalorimetry, Univ. of Basel, Switzerland
[3]IC2MP, Univ. of Poitiers, France
[4]GEOPS, Univ. of Paris-Saclay, CNRS, France
[5]CV Associés Engineering, France
[6] Univ. Bordeaux, CNRS, INSERM, Bordeaux Imaging Center, France
[7]Department of Marine Sciences, University of Connecticut, United States

In estuarine mudflats, diatoms often form intertidal biofilms through the excretion of large quantities of extracellular polymeric substances (EPS). These organic matrices allow for cell motility, protect against desiccation, provide a means for chemical communication and act as a barrier against pathogens. EPS interact with clay minerals and quartz grains producing an organo-mineral complex. Previous studies of EPS preservation focused on the uppermost millimeters to centimeters of the sediment. In our study, we characterized the preservation of EPS physico-chemical properties in a six-meter sedimentary core, obtained from an estuarine point bar in the Gironde estuary (France). Sixteen subsamples distributed along the depth of the core were used for grain size analyses, TOC measurements, cryo-scanning electron microscopic observations, and EPS extraction. The physico-chemical properties of EPS and alteration with depth were determined using/with various colorimetric assays (Alcian blue, phenol-sulfuric and Lowry), Fourier-transform infrared spectroscopy and acid-base titrations. The results show a preservation of the organo-mineral complex from the surface to the bottom of the core. EPS properties (quantity, acidity) were similar at the surface and at depth, and are statistically independent from sediment properties (grain size, TOC). The preservation of EPS several meters deep in the sediment could be explained by the interaction with minerals e.g., clay minerals, quartz, but also by the high sedimentary rates characteristic for the estuarine point bar (up to several cm. year^{-1}), minimizing microbial alteration. Furthermore, the variations of EPS properties with depth could be linked with phases of point bar migration and stabilization. Our results provide novel insights into the role of sedimentation on EPS preservation and ultimately, sediment (mineral) composition.

Mots-Clés : Estuarine sediments, exopolymeric substances, clay-coat

Merci de ne rien inscrire dans cette zone et ne pas modifier les marges des pieds de page et entêtes.