The Red Sea Metalliferous Sediments

M. Clara Modenesi and J. Carlos Santamarina
KAUST, Thuwal, Saudi Arabia (maria.modenesi@kaust.edu.sa)

The demand for metals and raw materials continues to increase as onshore deposits become more depleted. Our oceans contain large unexplored areas that may contain new resources in the form of Mn-nodules, Co-rich crusts, and massive sulfides. A complete characterization and assessment of these deposits are fundamental for the evaluation of resource extraction, separation, and disposal processes.

The Red Sea holds unique examples of sediment accumulations formed under distinctive environmental conditions. The Atlantis II deep is located in the central part of the Red Sea at 2 km depth and on top of the spreading axis. This deep accumulates sediments that result predominantly from the discharge of hydrothermal fluids into hot and stratified brine pools. The changes in environmental conditions and the hydro-chemical conditions in the brine pool control sediment formation. The accumulations are enriched with metals, such as Ag, Au, Cu, Co, and Zn. The sediments in this deep hold a record of the formation history and their brine pools tell a story about on-going processes.

On-going research at the Energy Geo-Engineering Laboratory EGEL, KAUST includes (1) Geotechnical index properties (liquid limit, grain size distribution, and specific surface) and consolidation tests to infer engineering properties, (2) Sediment classification based on the Revised Soil Classification System, (3) Geochemistry and mineralogy using XRD, ICP-OES and (4) Microstructure and texture with SEM imaging. An advanced sediment characterization of these fine-grained metalliferous deposits gives a comprehensive understanding of the soil behavior.