Geophysical Research Abstracts
Vol. 17, EGU2015-4807, 2015
EGU General Assembly 2015

Minerals and clay minerals assemblages in organic-rich facies: the case study of the Sinemurian-Pliensbachian carbonate deposits of the western Lusitanian Basin (Portugal)

Ana Caniço (1), Luís V. Duarte (1), Ricardo L. Silva (2), Fernando Rocha (3), and João Graciano Mendonça Filho (4)

(1) MARE – Marine and Environmental Sciences Centre, Faculdade de Ciências e Tecnologia, Universidade de Coimbra, Departamento de Ciências da Terra, Coimbra, Portugal, (2) Basin and Reservoir Laboratory, Department of Earth Sciences, Faculty of Sciences, Dalhousie University, Canada, (3) Departamento de Geociências and Centro Geobiotec, Universidade de Aveiro, Portugal, (4) Departamento de Geologia, Instituto de Geociências, Centro de Ciências Matemáticas e da Natureza, Universidade Federal do Rio de Janeiro, Brazil

The uppermost Sinemurian–Pliensbachian series of the western part of the Lusitanian Basin is composed by hemipelagic carbonates particularly enriched in organic matter. Great part of this succession, considered to be one of the most important potential source rock intervals of Portugal, crops out in the S. Pedro de Moel and Peniche sectors, belonging to the Água de Madeiros and Vale das Fontes formations.
In this study, supported by a detailed and integrated stratigraphic framework, we analyzed 98 marly samples (whole-rock mineralogy and clay minerals assemblages) from the aforementioned formations in the S. Pedro de Moel and Peniche sectors. X-ray Diffraction analysis followed the standard procedures and the semi-quantification of the different mineral phases was calculated using MacDiff 4.2.6. The goals of this work are to demonstrate the vertical variability of the mineral composition of these two units and investigate the relationship between the clay minerals assemblages and the content in organic matter (Total organic carbon: TOC).
Besides the abundance of calcite and phyllosilicates, whole-rock mineralogy revealed the presence of quartz, potassium feldspar, dolomite, and pyrite (trace amounts). Other minerals like anhydrite, barite and gypsum occur sporadically. The clay minerals assemblages are dominated by illite+illite/smectite mixed-layers (minimum of 59%), always associated with kaolinite (maximum of 37%) and chlorite (maximum of 25%); sporadically smectite occurs in trace amounts.
Generally, high TOC levels (i.e. black shale facies with TOC reaching up to 22 wt.% in both units, see Duarte et al., 2010), show a major increase in chlorite and kaolinite (lower values of illite+illite/smectite mixed layers). A kaolinite enrichment is also observed just above the Sinemurian–Pliensbachian boundary (base of Praia da Pedra Lisa Member of Água de Madeiros Formation; values varying between 30 and 37%). This event is associated with a second-order regressive phase, and marks the disappearance of the organic-rich facies and increase of carbonate sedimentation. This enrichment was likely favored by the development of more humid conditions at the Sinemurian–Pliensbachian transition.

References

Duarte, L.V., Silva, R.L., Oliveira, L.C.V., Comas-Rengifo, M.J., Silva, F. 2010. Organic-rich facies in the Sinemurian and Pliensbachian of the Lusitanian Basin, Portugal: Total Organic Carbon distribution and relation to transgressive-regressive facies cycles. Geologica Acta 8, 325–340.