

The Miocene Rhodalgal Amposta Limestone in the Tarraco Reservoir (Offshore Eastern Spain)

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Abstract

The Middle Miocene Amposta Limestone, formerly defined as Amposta Chalk, is a non-economic hydrocarbon reservoir in the Tarraco Field (Gulf of Valencia). This lithostratigraphic unit is made up of platform carbonates with coralline algae and forms cyclic decametric to metric alternations of rhodolith-rich and rhodolith-poor facies. Other associated facies are dominated by i) bryozoans, ii) Amphistegina, iii) loosely-packed laminar red algal thalli and iv) coralline algal debris. Coeval outcrops in the adjacent Penedes Basin are characterized by coral-bearing carbonates and poor development of the red algal facies. Accordingly, the Amposta Limestone facies in the Tarraco Field are considered as representative of deeper depositional settings. The depositional profile of the Amposta Limestone in the Tarraco Field is interpreted to be a carbonate ramp that grades into distal dark fine-grained deposits rich in planktic foraminifera. There is a pervasive micro-dolomitization affecting in different degree the succession. Coastal facies, lagoonal deposits or subaerial exposure surfaces were not recognized. A significant part of the red algal succession has a microporous/chalky fabric. Chalkification is interpreted as related to micro-corrosion processes. Primary intra-skeletal micro-porosity (i.e., red algal cells, foraminifera and bryozoan chambers) is partly preserved. In addition, there is an important contribution of micro-vuggy porosity. The non-chalky parts of the Amposta Limestone include pervasive blocky calcite cementation. Porosity varies between 10-26% and permeability from 3 to 20 mD. The Amposta Limestone succession observed in the Tarraco Field has some close analogies to the Perla gas field (Gulf of Venezuela). Both cases correspond to red algal carbonate systems developed during major transgressive trends that were finally drowned and capped by glauconitic units. Additionally, both carbonate units overlie a clastic syn-rift succession and show similar diagenetic and reservoir properties. However, there are also differences as the Perla Field is Late Oligocene-Early Miocene in age and contains more abundant and diverse larger foraminifera. Moreover, the Perla carbonates interfinger with thin proximal ramp facies rich in corals and skeletal sandstones, which were not observed in the Tarraco Field. The Amposta Limestone is also a useful analogue to other comparable reservoir facies in the Caribbean, Middle East and SE Asia.