



Electrofacies Classification in a Core of the Presalt, Santos Basin, on the Basis of a High-Resolution Rock-Log Correlation

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Abstract

Rock-log correlation to establish electrofacies is a challenging task caused by the complex carbonate reservoirs of the Brazilian presalt interval. The main problem is a similar response of the majority of carbonates to basic well-logs turning difficult the differentiation between rocks. On the other hand, diagenetic processes can disturb dramatically the rocks response to the well-logs. The main objective of this work is to present an alternative way to perform a rock-log correlation to recognize electrofacies in a core from the Presalt of the Santos Basin. The depth adjustment core-log, a fundamental step, is generally provide using a coregamma, unavailable for our study. Because of this lack of information, we adjust values of petrophysical porosity measured in laboratory from core-plugs to the effective porosity from the magnetic resonance log. The best adjustment of these porosities occurred with the core shifting of 3.5m down. Before the shifting, the relative error was 51% and after this shifting, the adjustment reduces the error to it is 24%. We calibrated the geophysical well logs - Gamma Ray (GR), Spectral Gamma Ray (SGR), Spectroscopy Logging Tool (SLT), Density (RHOB), Photoelectric Factor (PE), Sonic (DT) and Nuclear Magnetic Resonance (NMR) - with rock data derived from core, plugs and thin sections, such as lithology, cement, granulometry and sorting to determinate the classification of four electrofacies: BV-1 and BV-2 (Barra Velha Formation); ITP-1 and ITP-2 (Itapema Formation). BV-1 is predominantly composed by reworked sediments, mainly grainstones. The cement is basically composed of calcite and/or dolomite, medium to coarse grain size and well sorting. This electrofacies is characterized by relatively low values of GR and SGR (thorium and uranium), low silica content, high calcium quantity, low densities and slowless and high values of PE and porosity. BV-2 is essentially composed by laminites, spherulites and shrubs. It generally presents dolomite cement, clay matrix and varied sorting. This electrofacies is characterized by relatively high values of GR and SGR (thorium and uranium), medium to high values of silica content, medium to low calcium quantity, high densities and low values of PE and porosity. The ITP-1 and ITP-2 electrofacies are formed by coquinas. ITP-1 is mainly composed by rudstones and floatstones with calcite cement, coarse granulometry and normal to bad sorting. This electrofacies is characterized by relatively low values of GR and SGR (thorium and uranium), high calcium content, low silica quantity, medium density, low slowness and high values of PE and porosity. The ITP-2 is like the ITP-1. However, the ITP-2 presents higher silica content and, consequently, lower slowness and porosity and higher density and quartz cement quantity than ITP-1. These electrofacies provide an understanding of both depositional and diagenetic responses to well logs for the identification of key-surfaces to correlate wells of the presalt interval.

Keywords: Rock-log correlation, electrofacies, presalt.