GEOCHEMICAL AND MINERALOGICAL MODELING OF THE PRE-SALT CARBONATE RESERVOIRS IN THE SANTOS BASIN THROUGH WELL LOGS AND ARTIFICIAL INTELLIGENCE

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Knowing the geochemistry and mineralogy of rocks is essential for reservoir characterization. Geochemical and mineralogical models are created using the chemical elements present in the rock matrix to calculate mineral fractions. However, the availability of geochemical logs and rock samples in scenarios of cost reduction makes this modeling challenging. With these complexities, machine learning algorithms represent a solution for creating geochemical and mineralogical models aligned with cost reduction scenarios. For the geochemical model, a database was created with logs commonly acquired in pre-salt as input and chemical elements as output. The algorithm XGBoost was trained to generate synthetic geochemical logs with satisfactory results. For the mineralogical model, a hybrid model was created through the integration of machine learning algorithms with a probabilistic model. The probabilistic phase used the estimates from the machine learning algorithms together wireline logs to estimate the fractions of several minerals observed in pre-salt rocks. The trained geochemical and mineralogical models were applied to data from well logs not used in training to test their quality in real situations. The models were able to honor the real geochemical logs and mineral fractions observed in XRD analysis, confirming their robustness and generalization capacity in cost reduction initiatives.

KEYWORDS: WIRELINE LOGS, GEOCHEMICAL LOGS, MINERALOGICAL MODEL, MACHINE LEARNING, ARTIFICIAL INTELLIGENCE