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Editorial: Advanced techniques and applications for characterizing the hydrocarbon potential in carbonate reservoirs

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Editorial on the Research Topic
Advanced techniques and applications for characterizing the hydrocarbon potential in carbonate reservoirs

Even though carbonate rocks account for approximately half of the world's hydrocarbon reservoirs (Harbaugh, 1967) in the form of conventional and unconventional reservoirs (Sarhan, 2020; Sarhan, 2021; Farouk et al., 2022a; Farouk et al., 2022b), many questions remain about their function as intervals that contain hydrocarbons. The complex interaction between pore systems and rock fabric, as well as the variety of facies and deformational styles that carbonate rocks display, are the main causes of the complexity. Because carbonate reservoirs contain a variety of primary and secondary porosities, such as intergranular, intercrystalline, vuggy, moldic, and fractured porosity, it can be difficult to locate hydrocarbon zones within carbonate successions.

Furthermore, a variety of diagenetic processes and depositional conditions have an impact on the size of the pores found in carbonate rocks (Radwan et al., 2022; Nabawy et al., 2023), which range widely from micro-to mega-pores. Pore networks are especially important in carbonate hydrocarbon reservoirs because they control fluid flow, reservoir quality, and production results. Fractured carbonate reservoirs are a major contributor to many massive fields and play a significant role in the world's oil and gas production (Sarhan and Selim, 2023; Sarhan et al., 2017). The formation of different kinds of fractures adds to the natural heterogeneity found in rocks that contain hydrocarbons in carbonate formations. Fluid flow is improved by open fractures because they increase the permeability of hydrocarbon reservoirs. Conversely, by obstructing fluid flow, fractures packed with minerals can cause compartmentalization (Massaro et al., 2018). Even though fractures are crucial in determining reservoir permeability, many reservoir studies frequently ignore them. The inadequacy of comprehensive quantitative data on fractures is a contributing factor to this oversight, which is a result of the intricate interactions between matrix porosity, permeability, and fractures.

In order to fully assess carbonate reservoirs, this challenge requires advanced methods in seismic acquisition, processing (Ewida and Sarhan, 2023a; Ewida and Sarhan, 2023b; Ewida and Sarhan, 2023c), visualization, and contemporary well log analysis (Elmahdy et al., 2023; Sarhan, 2023). These techniques are essential for developing a deeper comprehension of the

complex interactions between fractures and other reservoir properties, which enables more precise evaluations of the performance and characteristics of the reservoir.

This Research Topic offers a few original research papers on scientific studies of carbonate reservoirs. The studies that are being presented deepen our comprehension of the evaluation of carbonate reservoirs all over the world. Special regard was inclined to studies focusing on the evaluation of the perceptivity of the fractured carbonate reservoirs. Moreover, this Research Topic discusses the impact of the depositional environments and diagenesis on the reservoir quality prediction of various carbonate depositional systems. The significance of this Research Topic lies in its potential to provide valuable insights for professionals in the oil industry. The knowledge and findings presented within the issue will ultimately aid workers in developing a more comprehensive understanding throughout the various stages of hydrocarbon exploration, evaluation, and production from carbonate rocks. By addressing the complexities and challenges associated with carbonate reservoirs, the information disseminated in this Research Topic can contribute to improved strategies, technologies, and decision-making processes in the oil and gas sector.

Author contributions

MS: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing–original draft, Writing–review and editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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