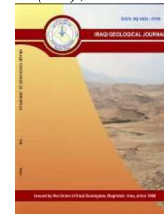




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Investigation of the Geochemical Properties and Origin of the Crude Oils Accumulated in the Mishrif Reservoirs in the Zubair, Halfaya, and Buzurgan Oilfields, Southern Iraq

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Abstract

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The Mishrif Formation is among southern Iraq's most important reservoirs, which contains a third of the oil in the Cretaceous reservoirs, which is a broad carbonaceous succession in Iraq and the surrounding area. For detecting differences in the geochemical characteristics of crude oil, three crude oil samples were obtained from the Mishrif carbonate reservoir intervals in the Cretaceous at the Zubair, Halfaya and Buzurgan oilfields in southern Iraq. Analyses utilize API gravity, sulfur concentration, Gc, Gc/MS, and bulk carbon isotope compositions. The low API (23 to 28) and high sulfur content (4.45 to 5.36 wt%) of the oils studied can be linked to the deposition of a marine carbonate environment under sulfate-reducing environments. The anoxic, non-biodegradation, organic matter type II-S, marine carbonate depositional was indicated by the pristane/ nC₁₇ (0.16 to 0.26), phytane/ nC₁₈ (0.29 to 0.31), narrow Pr/Ph ratio range from 0.76 to 0.78, high C₂₉/C₃₀ hopane ratios of 1.01–1.71, and low C₂₆/C₂₅ tricyclic terpene ratios in the related source-rock. TAS3 (CR) ratios of 0.33 to 0.36, C₂₇ Ts of 0.18 to 0.22, and 29 sterane 20S/20R sterane ratios all refer to early maturity. Biomarker parameters and bulk carbon isotope values in the oil analysis match those found in the Sulaiy and Yamama sources of the Late Jurassic-Early Cretaceous.

Keywords: Mishrif Formation; Geochemical properties; Zubair Oilfield; Buzurgan Oilfield; Halfaya Oilfield

1. Introduction

The Cenomanian-Turonian Mishrif reservoir (Chatton and Hart, 1991) is composed of carbonate deposits from rudist-bearing units and extends throughout southern and central Iraq within the Mesopotamian foredeep and Zagros fold belt (Aqrabi et al., 2010). With its excellent reservoir and petrophysical characteristics, it is regarded as one of Iraq's most important reservoirs (Al-Mimar et al., 2018). It contains oil in various oilfields, including Amara, Gharraf, Majnoon, Buzurgan, Jabal Fauqi, Halfaya, East Baghdad, Ahdab, North and South Rumaila, West Qurna, Noor, Tuba, Ratawi and Nasiriyah (Fig. 1) (Aqrabi et al., 2010), and its oil reserves account for almost 40% of Iraq's total oil reserves (Al-Sakini, 1992). The Mishrif Formation is a widespread carbonate succession including regions throughout the Arabian Gulf. It is stratigraphically believed to be part of the Wasia Group (Mahdi and Aqrabi, 2014, Al-Mimar and Awadh, 2019). The Yamama, Zubair, Maaddud, Rumaila,

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