

The origin of oil in the Cretaceous succession from the South Pars Oil Layer of the Persian Gulf

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Abstract The origin of the oil in Barremian–Hauterivian and Albian age source rock samples from two oil wells (SPO-2 and SPO-3) in the South Pars oil field has been investigated by analyzing the quantity of total organic carbon (TOC) and thermal maturity of organic matter (OM). The source rocks were found in the interval 1,000–1,044 m for the Kazhdumi Formation (Albian) and 1,157–1,230 m for the Gadvan Formation (Barremian–Hauterivian). Elemental analysis was carried out on 36 samples from the source rock candidates (Gadvan and Kazhdumi formations) of the Cretaceous succession of the South Pars Oil Layer (SPOL). This analysis indicated that the OM of the Barremian–Hauterivian and Albian samples in the SPOL was composed of kerogen Types II and II–III, respectively. The average TOC of analyzed samples is less than 1 wt%, suggesting that the Cretaceous source rocks are poor hydrocarbon (HC) producers. Thermal maturity and Ro values revealed that more than 90 % of oil samples are immature. The source of the analyzed samples taken from Gadvan and Kazhdumi formations most likely

contained a content high in mixed plant and marine algal OM deposited under oxic to suboxic bottom water conditions. The Pristane/nC₁₇ versus Phytane/nC₁₈ diagram showed Type II–III kerogen of mixture environments for source rock samples from the SPOL. Burial history modeling indicates that at the end of the Cretaceous time, pre-Permian sediments remained immature in the Qatar Arch. Therefore, lateral migration of HC from the nearby Cretaceous source rock kitchens toward the north and south of the Qatar Arch is the most probable origin for the significant oils in the SPOL.

Keywords Source rock · Cretaceous · South pars oil layer · Persian Gulf · Kerogen

Introduction

The South Pars is a well-known oil and gas field located between Iran and Qatar (Fig. 1). In Qatar, the field is

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