DIAGENESIS OF NON-MARINE PETROLEUM RESERVOIRS: THE NEOCOMIAN (LOWER CRETACEOUS) SHURIJEH FORMATION, KOPET-DAGH BASIN, NE IRAN

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Detailed petrologic, sedimentologic and geohistory analyses have been carried out on the Neocomian (Lower Cretaceous) Shurijeh Formation in the eastern part of the Kopet-Dagh Basin, NE Iran. The results of these analyses show that the diagenetic history of Shurijeh sandstones was affected by their depositional settings, and the subsequent subsidence of these units through meteoric and compactional hydrologic regimes in this part of the Kopet-Dagh Basin. These rocks consist mostly of sub-litharenitic red beds deposited during a regressive phase of sedimentation dominated by rapid siliciclastic sediment supply. The lower and middle portions of the interval studied were deposited in low-sinuosity braided fluvial systems, and the upper portion was deposited in high-sinuosity meandering systems.

The porous and permeable sand-rich units were partially filled by infiltrated clays, and early calcite, anhydrite and silica cements as they subsided through the meteoric regime. In the compactional regime, feldspars altered to clays, dolomite replaced calcite and penetrated authigenic silica, and a late-stage of calcite cementation and replacement took place. These diagenetic events were followed by partial dissolution of early and late-stage calcite cements that created secondary porosity in the sandstone units. During the late Miocene—early Pliocene (approximately 10 million years), the Late Alpine Orogeny resulted in the formation of structural traps in the Shurijeh Formation of the Sarakhs area. This was followed by migration of gas into the porous units of this formation, accounting for the Khangiran and Gonbadli gasfields.

Relationships revealed in this study can be used to develop diagenetic models that will help predict diagenetic styles in dominantly non-marine sandstones in other basins similar to the Kopet-Dagh of Iran.

INTRODUCTION

Neocomian (Lower Cretaceous) sandstone units of the Shurijeh Formation comprise important gas reservoirs in the Kopet-Dagh Basin, NE Iran. These sandstones crop out in an eastward-plunging anticline in the eastern part of the basin (Fig. 1). The Shurijeh Formation varies in thickness from 900 m (2,950 ft) in the western part of the outcrop belt, to less than 100 m (360 ft) along the eastern edge of the belt in the study area. In the subsurface to the north, its thickness varies between 232 m (772 ft) in the KG-2 well and 240 m (787 ft) in the GL-3 well. These siliciclastic rocks consist primarily of red beds that were interpreted to have been deposited in a variety of fluvial environments (Moussavi-Harami, 1986; Moussavi-Harami and Brenner, 1990). Most of these sand-rich lithologies are sub-litharenitic in composition, with high quartz contents.

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