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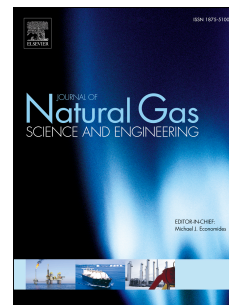
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Organo-mineralogical Insights of Shale Gas Reservoir of Ib-River Mand-Raigarh Basin, India

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Abstract

In the present study, Permian shale beds of Ib-River Mand-Raigarh Basin have been evaluated for insights of depositional conditions, organic, clay and mineral composition allied to shale matrix. The shale core samples were obtained during exploratory drilling and analysed for the properties like proximate, petrography, Rock-Eval, Total organic content (TOC), X-ray diffraction (XRD) and X-ray fluorescence (XRF). The values of vitrinite content and TOC varies from 2.00 - 16.20 (vol.%) and 1.88 - 6.99 wt. % with an average value of 10.34 (vol.%) and 3.75 (wt.%) respectively, suggesting fair to excellent source rock potential of shale for gas. Whereas, results of the Rock-Eval pyrolysis indicated fair to very good source rock potential (S1: 0.04 - 0.22 and S2: 0.57 - 39.45). The indicator of thermal maturity parameters like T_{max} (423 - 470 °C) and VR_o (0.64 - 0.96 %), counsels moderately matured shales. The plot of hydrogen index (HI) vs oxygen index (OI), T_{max} vs HI and TOC vs HI illustrated the presence of type II and III kerogen in studied shales. The uniformity in carbon conversion elucidates negligible effects of intrusive and basin tectonics on shale reservoir which is validated from the passive stable tectonic setting of Ib-River Mand-Raigarh basin which favours deposition of organic matter. The high percentage of quartz (26.30 - 57.60 vol.%) signifying the resistive nature of SiO_2 towards erosion and weathering. However, the negligible or typical absence of K-feldspar and a large percentage of kaolinite (16.80 - 53.30 vol.%) attributed to the strong weathering process. Consequently, the instantaneous reduction condition supported the preservation and transformation of organic matter.

The paper focuses on the significance of various essential parameters like depositional conditions, organic richness, the degree of maturation, clay types and mineral constituents on the gas genesis and storage. The parameters interpreted through facies and evolution history of the basin to evaluate the prospects of shale gas resource development in Ib-River Mand-Raigarh Basin, India.

Keywords: Organic; thermal maturity; mineralogical composition; depositional conditions; kerogen type.

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