EFFECT OF ORGANIC CONTENT ON PETROPHYSICAL PROPERTIES OF PALEOCENE SHALES FROM UPPER INDUS BASIN, PAKISTAN

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ABSTRACT

Shale formations of various ages, widely distributed in all sedimentary basins of Pakistan, proved being source rocks for petroleum systems. Among these organic shales, the Paleocene shale of the Patala Formation in the upper part of Indus Basin is considered as a potential shale gas play. Understanding and control on the elastic and seismic properties of this shale reservoir is crucial for exploration and successful gas production from these plays. In this paper, the seismic characteristics and petrophysical response of organic-rich Patala shale is studied based on data from eight exploratory wells. The total organic carbon content (TOC) has first order impact on the compressional and shear wave velocity, as well as the density and resistivity of the organic-rich shales. TOC, level of maturity and vitrinite reflectance are computed by using wireline log data. The estimated TOC and the vitrinite reflectance are in the range of 0.4-4.7% and 0.6-1.7%, respectively, indicating that the shales of Patala Formation can act as a self-sourcing reservoir rock, thus having strong potential for shale gas play.

The monotonic decrease in dynamic seismic parameters (density and seismic wave velocity) and at the same time increase in static elastic parameter (Young's modulus) with the clay and volume of kerogen are indicative of the presence of organic matter in shale zones. However, these elastic and seismic properties of the shale are completely anisotropic and the degree of anisotropy may be correlated with clay content, organic material concentration and shale fabrics. The results of this study reveal that the impact of TOC on the resistivity, density and seismic velocities affected by the change in level of maturity.

Keywords: *Unconventional reservoir, TOC, shale gas, petrophysical properties, Indus Basin*