Organic Geochemistry of the Early Jurassic Datta Formation: Implications for Source Rock Evaluation, oil-oil and oil-source Correlation in the Potwar Sub-Basin, Pakistan

Samina Jahandad[1*], Syed Waqas Haider[1], and Saba Nazir[1]
[1]*Hydrocarbon Development Institute of Pakistan, Islamabad*
[*]*Email: samojahandad@gmail.com*

An extensive geochemical study is conducted to evaluate source rock potential of Datta shales in the Potwar Sub-basin through TOC measurement, Rock Eval pyrolysis, organic petrography, and biomarkers analysis. The study examines the source input, environment of deposition and thermal alteration of organic matter along with oil-source correlation using core/well-cuttings data of Toot-17 well. The results indicate that a significant percentage of Datta shales samples show fair to good potential and early to late mature stage having Type-III kerogen with vitrinite as a dominant maceral. However, a fraction of Datta shale with HI values less than 50 mg HC/g TOC has Type-IV kerogen and predominantly inertinite macerals. The biomarker composition analysis and microscopic investigation indicate that primarily terrestrial organic matter was deposited in a marine environment under relatively suboxic conditions. Stereo-isomeric composition of steranes and terpanes indicate that the samples are thermally mature, falling in late oil window. Furthermore, Pr/nC17 and Ph/nC18 values indicate that the samples are not biodegraded. The star correlation diagrams for oil-source correlation exhibit significant similarities between crude oil and Datta shale samples, thereby suggesting Datta shales as source for the oil.