

One Dimensional (1D) maturity modeling of Lower to Middle Jurassic Petroleum System of Indus Basin, Pakistan

Fahad Ali^{1,2*}, and Shiqi Zhang¹

¹*School of Geoscience, China university of Petroleum, East China, Qingdao;*

²*Department of Geology, Bacha Khan Univ., Charsadda, KP, Pakistan*

**Email: fahadalizai@bkuc.edu.pk*

1D maturity modeling of the Lower to Middle Jurassic in the Indus Basin, Pakistan is carried out to know the burial history, petroleum system, thermal history, paleo-heat flow, source rock maturity, and hydrocarbon generation and expulsion capacities of source rock. The wells across the Upper Lower Indus Basin are selected to carry 1D modeling with the help of Petromod (PM) basin modeling software. Data for the software analysis were adopted from the established literature and public-domain databases. Besides geochemical analysis, well logs, outcrop stratigraphic logs and well sections data were acquired to determine lithostratigraphy, eroded or non-deposited sections and true stratigraphic thickness for performing petroleum system modeling. The stratigraphic thicknesses of Lower to Middle Jurassic are based on current work and the information regarding the stratigraphy of Indus Basin and the erosional durations of its strata are obtained from published data. The mean value of TOC and HI are put together along with the information of precise layers, time of erosion, chronological ages, and definite kinetic model in one-dimensional modeling of the petroleum system. Besides these, the latitude of the basin, the temperature of global mean surface temperature (SWIT), paleo depth of water (PWD) and flow of heat (HF) are the most important requirements, which explain the boundary condition in the basin. The output result includes; the burial, depth, and time plots, these are used to model the hydrocarbon zoning throughout the burial history and estimate the quantities of oil generation. The kinetic models for kerogen type II were applied in the PSM to evaluate the relative retention capability of the Lower to Middle Jurassic shales. The paleo-temperature history is found out through the Ro % model, and the Tissot and Welte (1984) methods are used to simulate the hydrocarbon generation history.