

15.2

Oil shale deposits of Jordan: genesis and mode of occurrences through petroleum geochemical signatures

Hazem Ramini

Natural Resources Authority, Amman, Jordan

The near surface and deep seated Maastrichtian Maaqqar Chalk Marl (MCM) Formation of Jordan has been studied through petroleum geochemical methods (LECO, Rock-Eval Pyrolysis, gas chromatography, and gas chromatography mass spectrometry) and transmitted and reflected light microscopy. The data have been used to assess the hydrocarbon source potential of the abundant marine bituminous marly limestone (oil shale) intervals developed within the formation. The organic matter of this oil shale is an algal material (type II kerogen) having rich oil potential. The oil shale has an organic carbon content of up to 28% and hydrogen index values of up to 1200. Pyrolysis yields (TOC, S₂, and HI) and organic petrography (kerogen type, quantity, and organic maturation level) indicate that this oil shale has tremendous hydrocarbon source rock potential, and contains type IIS kerogen. Organic petrography studies revealed that the thermal maturity assessed by using spore color index and the pyrolysis T_{max} indicate that the Maastrichtian MCM Formation has probably entered the threshold of oil generation within specific sedimentary basins of Jordan and produced medium gravity oil and heavy oil. In widespread parts of the basins, oil shale is immature on higher parts of structures. Scanning electron microscope (SEM) studies of the Maastrichtian MCM samples show the presence of bitumen filling foraminiferal chambers. This study revealed that the oil shale was deposited in a hyper-saline marine environment under highly reducing conditions.