

Research Article

Hydrocarbon generation potential of the Upper Triassic-Middle Jurassic coal-bearing strata in the Parvadeh mine, Tabas, east-central Iran

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1-Introduction

Recent investigations have emphasized the significance of the hydrocarbon-generation potential of coal-bearing intervals in the Parvadeh area of the Tabas Basin, based on detailed analyses of organic petrography and vitrinite reflectance (Zamansani et al., 2019; Esmailpour et al., 2022; Zamani et al., 2023a, 2023b). Zamani et al. (2023a) demonstrated that the coal seams of the Nayband Formation in the Parvadeh region (Tabas Block) were deposited in a paralic environment influenced by marine conditions and located within the lower delta plain. Furthermore, Zamani et al. (2023b) reported vitrinite reflectance values ranging from 0.97% to 1.35% for coal seams B1, B2, C1, and C2. Similarly, Esmailpour et al. (2022) documented reflectance values of 1.13% to 1.54% for seams B1, B2, and C1, whereas Zamansani et al. (2019) identified a range of 1.17% to 1.37% for the same seams in the Parvadeh Coal Mine. Because vitrinite reflectance measurements, organic petrographic observations, and Rock-Eval pyrolysis data are fundamental for evaluating thermal maturity, predicting oil- and gas-generation potential, and characterizing coal quality, this study focuses on the Qadir Member of the Nayband Formation, as well as the Ab-e-Haji and Parvadeh Formations, based on borehole data from Block 7 of the Parvadeh-4 area. The results of this study provide important insights into coal quality, methane generation potential, and methane explosion hazards within the coal seams of the Parvadeh Coal Mine.

2-Materials and methods

In this study, 135 drilling core boxes from the Nayband, Ab-e-Haji, Badamu, Hojedk, and Parvadeh Formations, representing a total core length of 641.1 m, were subjected to detailed lithological description. From these cores, 35 representative samples were selected for organic petrographic analysis and evaluation of the gas-generation potential of the coal-bearing intervals. Laboratory investigations include Rock-Eval pyrolysis, vitrinite reflectance measurements, and organic petrographic analyses. Of the 35 samples, 14 polished sections were prepared and examined under reflected light microscopy using an Olympus BX60 microscope for organic petrography. These analyses were conducted at the Petrography Laboratory, Department of Geology, University of Isfahan, Isfahan, Iran. Subsequently, 5 polished sections from samples with the highest TOC values were selected for vitrinite reflectance measurements using a Leica DM-4500 microscope equipped with a J&M TIDOS MSP 200 photomultiplier system, following ASTM D7708 standards, at the Research Institute of Petroleum Industry (RIPI), Tehran. In addition, to evaluate the source-rock characteristics of the studied succession, 10 powdered core samples were analyzed by Rock-Eval 6 pyrolysis (VINCI Technologies) at RIPI.

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