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Geochemical and Geophysical Investigations on the Uhangri Formation in the Haenam Basin, Southwestern Part of Korean Peninsula

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Uhangri Formation, which locates in the Haenam Basin, the southwestern part of Korean peninsula, is known to have shale formations containing organ materials. Many geologists of Korea keep interests in the Uhangri formation, having made several geological surveys. Thus, we investigate the shale formations to provide basic information on the geochemical and geophysical characteristics of the Uhangri Formation for a better interpretation of the Haenam sedimentary basin. For the study area, we have made not only organic geochemical analysis on rock specimens from the drilling, but also geophysical well logging (including acoustic velocity, natural gamma, density, normal resistivity and televiewer logging). The cretaceous Haenam consists of four major lithofacies; andesitic tuff facies, Uhangri formation, Hwangsan tuff, and Jindo rhyolite in ascending order. The drilling investigation of the study site has identified three lithofacies, including (1) greenish grey grain-supported tuff facies (surface to 176 m in depth, Hwangsan tuff), (2) black shale facies interbedded with pebble-bearing sandstone and tuff (176-420 m, Uhangri formation), and (3) matrix-supported reddish brown tuff facies (420-512 m, andesitic tuff). The black shale facies also can be classified into three parts, depending on the combination of the pebbly sandstone and tuff interbedded in the shale formations. The results of the organic geochemical analysis show that the shale core specimens from the depth of 187-205 m and 286-300 m yields relatively higher total organic carbon (TOC) content of more than 1 % (higher organic materials included) than other shale specimens. Both free hydrocarbon and potential hydrocarbon contents are very low (<0.1 mg HC/g Rock) from entire shale formations, while residual carbon and TOC contents are nearly same. In addition, hydrogen index is very low as less than 10, indicating that most of hydrocarbon migrated after they had been generated. Based on the geochemical and core analyses, we construct rock physics models for simulations of rock physics models using several strategies for resistivity computation including Archie's equation and compare between the constructed rock physics models. For the models, we make numerical simulations of short and long normal logging measurements, respectively, using a goal-oriented and self-adaptive hp finite-element algorithm (where h indicates element size and p the polynomial order of approximation) in order to make comparison of simulation results with field logging data for a further interpretation of the field data. Through the geochemical and geophysical analyses, we better understand the geological characteristics of the Uhangri Formation, emphasizing the importance of joint interpretation