HYDRORETORTING, ROCK-EVAL, AND FISCHER ASSAY ANALYSES OF SOME WORLD OIL SHALES

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ABSTRACT

Oil shales of varied origin and age were found to respond widely to hydroretorting assay (HA). For oil shales containing ≥40 liters of shale oil per metric ton by HA, the yields by HA ranged from 110 to 461 percent of yields obtained by Fischer assay (FA).

To gain a better understanding of how different oil shales respond to HA analysis, 92 samples of oil shales of lacustrine, terestrial, and marine origin ranging in age from Cambrian to Tertiary were collected from more 30 deposits around the world. The samples, typed by A. Hutton's classification, included 52 marinites, 22 lamosites, 3 tasmanites, 1 kukersite, and 14 samples of undetermined type. In addition to HA and FA analyses, the samples were also analyzed by Rock-Eval and the qualitative mineralogy of the samples was determined by X-ray diffraction. The resulting data indicate that the type of kerogen, as well as the degree of geothermal maturation of the deposit, are significant factors in the oil syields that were obtained.

The marinites (35 samples) gave the best HA results, ranging from 141 to 461 percent of FA and averaging 252 percent. Some of the best samples of this group include those from the Devonian oil shales of the eastern U.S. and Canada; the Cretaceous oil shales of Morocco, Jordan, and Israel; and the Cambrian Alum Shale of Sweden. The Alum Shale is particularly noteworthy; HA results for two samples were 302 and 461 percent of FA. However, oil yields by HA and FA decrease to nil for samples of Alum Shale from Norway where the deposits were strongly altered by thermal metamorphism. In comparison to the marinites, the HA results for the lamosites and tasmanites (23 samples) were lower, ranging from 86 to 192 percent of

FA and averaging 135 percent of FA. The lower results are probably due to the higher hydrogen content of the lamosite kerogen compared with the marinite kerogen. No significant correlation was found between the HA/FA ratios and the mineralogy of the samples.