

A comparison of the ease of extraction and chemical structure of oils from Jordanian and U. S. oil shale and an algal coal, torbanite

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This paper describes attempts to evaluate the ease of extraction of oil from two oil shale samples from different origins, Jordan (El-Lajjun) and the U. S. (Colorado) and to compare the chemical structure of the oils. The results are also compared with values for reactions of torbanite, an algal derived coal. Samples of the two shale deposits and torbanite have been characterised using elemental analysis, Pyrolysis Gas Chromatography/Mass Spectrometry (Py-GC/MS) and ¹³C Nuclear Magnetic Resonance (NMR). The shale samples have been heated over a range of temperatures from 355-425°C in small autoclaves with N₂, H₂ or CO and the products separated into asphaltols, asphaltenes and oils using selective solvent extraction. Some reactions were carried out with an equal mass of water with and without the addition of NaAlO₂. The liquid products have been characterised by ¹H NMR, GC-MS and in a few cases by elemental analysis. The reactivity pattern and oil structure for the two lacustrine derived materials, Colorado oil shale and torbanite, were found to be remarkably similar to each other and in sharp contrast to those for the marine-derived El-Lajjun oil shale with its higher sulphur content. Reactions of the Colorado oil shale in the presence of water show evidence for catalytic effects of alkaline NaAlO₂. The environment of the Colorado oil shale is rich in alkaline materials at some levels.