

SOURCE ROCKS IN WEST SIBERIA BASED ON OIL COMPOSITIONS

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Over three-hundred and fifty oils and over 150 core samples from the West Siberian Basin have been analysed. The oils come from the Pri-Ural, Frolov, Mid-Ob, Nadym-Pur, Pur-Taz, Yamal-Gydan and Vasyugan and Kamysov regions. Most routine organic geochemical techniques were employed in the study, including whole oil GC, deasphalting, MPLC and GC and GC-MS (SIR and MRM) of saturated and aromatic hydrocarbons. Stable carbon isotope analysis was also performed on all fractions. In addition, GC-IRMS was performed on oils from Yamal Gydan and Frolov.

Two marine and at least two non-marine source rock types could be defined based on analyses and published data (e.g. Peters et al., 1993, Kontorovich et al., 1997). One of the marine source rocks is the Upper Jurassic Bazhenov Fm., which is by far the most prolific source rock in the area, with up to at least 25% TOC and Rock-Eval S2 of 100 mg HC/g rock or more with type II or I/II kerogen. The other marine source rock is the Lower-Middle Jurassic Tyumen Fm. This is also a prolific source rock, particularly in northern West Siberia, with %TOC up to at least 5% and Rock-Eval S2 of 25 mg HC/g rock with type II kerogen in some intervals. It also appears to consist of several different shale sequences. Modern usage refers to the Togur Fm. as the oil prone section. However, several other shale formations are referred to in the literature and to what extent they are oil prone and geographical extent of each is not considered here.

There are at least two non-marine sequences with oil potential, these are Lower-Middle Jurassic Tyumen Fm. shales and Neocomian shales, carbargillites and coals. The Neocomian may not be mature enough for significant generation of liquid hydrocarbons, except in the north. It is probably a major source of biogenic and early diagenetic gases. The Tyumen Fm. shales vary considerably in composition from purely non-marine (lacustrine, paludal environments) to mixed marine and non-marine to more marine in parts. The lacustrine source rocks vary from good to rich with type II kerogen in part.

The oils can be divided up into several different families. The dominant family, typical for oils from marine anoxic source rocks, are sourced by the Bazhenov Fm.. This family can be divided into subgroups due to source facies variations. Apart from a few samples, the oils in Frolov, Mid Ob, Vasyugan and Kamysov have geochemical characteristics that are the same as is found in the Bazhenov Fm. source rock samples. Further north the Bazhenov Fm. changes slightly in composition (due mainly to a reduction in anoxicity) and many of the oils as far north as Russkoye (Pur-Taz), Severo-Gubkin (Nadym-Pur) and Novoportov (Yamal) are considered to be sourced by this Bazhenov facies. There is a small group of oils comprising a separate family of non marine origin. These are are mainly found in the Pur Taz region and are most probably sourced by non-marine Lower-Middle Jurassic algal-rich deposits (Tyumen Fm.).

Another large group of oils show intermediate characteristics, but most show characteristics typical of marine depositional environments. These are found mainly in the northern part of Nadym-Pur and in Yamal-Gydan. They have different origins, including, more terrestrial (nearshore marine?) Bazhenov Fm. and marine/nearshore marine source rocks of the Tyumen Fm. In addition, some oils might be co-sourced from both source rock types.

The main differentiating characteristics of the oils and source rocks are discussed, particularly steranes, tricyclic terpanes and stable carbon isotope composition of fractions.

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