

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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Geology and Geochemistry of Source Rocks in the Qaidam Basin, NW China

This study addressed some basic problems concerning petroleum systems in the basin, problems which persist despite some five decades of petroleum exploration. We show that three separate source rocks are present and these are distinct in terms of both age and depositional facies and also geographical distribution.

The oldest source rocks are Lower Jurassic fresh-water lacustrine deposits which are generally confined to the northern Qaidam region. These are currently thermally mature or highly mature and have generated the oils, condensates and gases which have been discovered in this area. Most of the oil in Tertiary reservoirs in the western Qaidam Basin has been generated from similarly aged source rocks.

Tertiary source rocks are saline lake deposits, and previous studies have shown that these are characterized by very low TOCs (0.2-0.6%). However, we found Tertiary source rocks with TOCs >1.0%; these were deposited in hypersaline conditions in the Manya depression. These source rocks have probably generated the oils recently discovered in the western Qaidam basin.

The youngest (gas-prone) source rocks in the basin are Quaternary. These were deposited in saline lakes in the east and central parts of the basin and are thermally immature. However they are thought to have generated large volumes of biogenetic gas present in Quaternary reservoirs.