

**AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003**

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Lacustrine Depositional Environments of Guadalupian Source Rocks in the Turpan, Junggar, and Santanghu Basins, Northwestern China

The depositional environments and distribution of Guadalupian lacustrine source rocks in adjacent Turpan, Junggar, and Santanghu basins, NW China, are critical to evaluating the source-rock potential and petroleum systems of these basins. ⁴⁰Ar-³⁹Ar ages and major and trace element analyses of 34 igneous samples indicate that they are intracontinental alkaline basalts, confirming extensional rifting during 260-290 Ma. The late-rifting (261-265 Ma) source rocks correlate in Turpan and Junggar basins and intervening Bogda Mountains but not Santanghu Basin, suggesting a single Turpan-Junggar lake of 183,500 km² and a Santanghu lake of 23,000 km². In 20 outcrops and 157 wells, source-rocks are average 406 m thick in Turpan, 660 m in Junggar, and 603 in Santanghu, and consist of black shale and torbanite with thin argillaceous micrite, containing *Turfania* sp., ostracods, and *Cordaitina-Hamiapollenites-Vittatina* assemblage, suggesting a lacustrine basin-plain environment. Presence of analcime, halite, pyrite, and abundant gammacerane and β -carotane in oils suggests saline anoxic water and warm semiarid climate. Additionally, Santanghu Basin contains thick dolomitic mudstone and tuff with thin dolomitic limestone, dolomite, and extrusive rocks. The $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values of a dolomite are 4.8‰ and -18‰, respectively; those of dolomitic limestone are average -11‰ and -15‰, respectively. Santanghu lake may have been warmer with a higher Mg/Ca ratio and less siliciclastic influx than Turpan-Junggar lake. The Guadalupian lacustrine shale and torbanite have high hydrocarbon potential of 19.3mg/g and 42.3 mg/g, respectively, suggesting that they are major source rocks in the basins.