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Organic Geochemical Evidence of Source Rock and Its Depositional Environment, the Nonmarine Santanghu Basin, Northwest China

Recent discovery in Santanghu Basin, NW China, demands identification of source rock and its depositional environment to understand the hydrocarbon systems. Biomarker correlation among potential source rock, crude oil, and residual oil indicate that Upper-Permian lacustrine shales are the source rocks. Both shales and crude oils contain abundant b-carotane and gammacerane but little tricyclic terpane with small Ph/Pr ratios, which also indicate a reducing hypersaline waterbody. Correlation between shales and residual oils in Carboniferous, Permian, Triassic, and Jurassic rocks show the same correlation as above. Shale points, however, do not completely overlap with oil points in cross plots between C24-tetracyclic terpane/ C3017á(H) hopane and tricyclic terpane/C3017á(H) hopane, 17á(H)-steranes and C3017á(H) hopane, and C28/C29(20S+20R) 14á(H),17á(H) steranes and C27/C2914á(H),17á(H) steranes, probably resulted from oil degradation. Maceral compositions of 26 Permian shales indicate lake-water chemistry. Macerals range from 0.5-22.3%, averaging 9.72% in 21 black shales and from 14.4-33.6%, averaging 24.8% in five carbonaceous shales. Hydrogen-poor macerals of mainly carbonaceous shales contain 40-100% vitrinite, 0-50% inertinite, and 0-30% exinite-and-sapropelinite (E+S). Hydrogen-rich macerals of mainly black shales contain 0-65% vitrinite, 0-25% inertinite, and 35-100% E+S, where abundant sapropelinite suggests macerals derived mainly from aquatic biota. In addition, d13C values of 22 kerogens range from -21.82 to -30.42ºë which become more negative with increasing sapropelinite (i.e. increasing aquatic biota-derived macerals). 68% d 13C values are <-24ºë suggesting kerogens derived mainly from aquatic biota. The results suggest that Upper Permian black shales were deposited in a highly reducing hypersaline lake and are more oil-prone than carbonaceous shales.