Origin of hydrocarbon and non-hydrocarbon gases in Zechstein Main Dolomite reservoir of western part of the Polish Permian Basin

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Origin of natural gas from Upper Permian reservoir was established based on the results of molecular and stable C, H and N isotope compositions of nine samples. Six additional samples from Kotarba *et al*. 2000 [1] were also used for interpretation. Hydrocarbon index $\delta^{13}C$ [C_{HC} = $CH_4/(C_2H_6 + C_3H_8)$] varies from 0.64 to 7.0 and stable isotope ratios change as follows: $\delta^{13}C(CH_4)$ -57.8 to -43.3 ‰, $\delta^{13}C(C_2H_6)$ -42.6 to -35.3 ‰, $\delta^{13}C(C_3H_8)$ -30.1 to -27.5 ‰ and $\delta^{2}H(CH_4)$ -292 to -225 ‰.

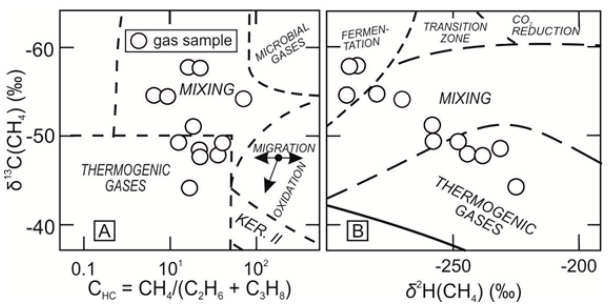

Figure 1. $\delta^{13}C(CH_4)$ versus (A) C_{HC} and (B) $\delta^{2}H(CH_4)$. Compositional fields after Whiticar [2].

Molecular and stable isotope compositions indicate that hydrocarbon gases were generated during both thermogenic and microbial processes from Type-II kerogen and mixed with different proportions. N_2 concentrations vary from 0.0 to 85.7 % and $\delta^{15}N(N_2)$ range from 7.0 to 14.5 ‰. A slight grow of $\delta^{15}N(N_2)$ values with N_2 concentrations indicates that molecular N originated from thermal decay of organic matter. H_2S and CO_2 concentrations vary from 0.11 to 2.9 % and from 0.00 to 3.0 %, respectively, showing a linear correlation which indicates that they could be produced during TSR, and partially MSR. $\delta^{13}C(CO_2)$ values changed from -9.3 to 2.9 ‰ suggesting that it was also formed during thermal and microbial degradation of kerogen.

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[1] Kotarba *et al*. (2000) *Prz. Geol*. **48**, 429-435. [2] Whiticar (1994) *Am. Assoc. Pet. Geo. Memoir* **60**, 261-283.