## Geochemical characteristics of natural gas reservoired in Lower Triassic Jialingjiang Formation in Naxi-Hejiang area, Southern Sichuan Basin, China

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Natural gases reservoired in Lower Triassic Jialingjiang Fm are mainly composed of alkanes, and the dry coefficients are more than 0.99, which indicates that the maturity of the gases is high.  $\delta^{13}C_1$  values of the gas vary from -35.3% to -29.4%, and  $\delta^{13}C_2$  values vary from -35.1% to -32.1%,  $\delta^{13}C_3$  values range from -31.2% to -23.7%, and the average values of  $\delta^{13}C_1$ ,  $\delta^{13}C_2$  and  $\delta^{13}C_3$  are -31.3%, -33.8%, -29.8%, respectively. Most of the carbon isotope series are reversed ( $\delta^{13}C_1 > \delta^{13}C_2 < \delta^{13}C_3$ ). Hydrogen isotopes values of methane ( $\delta D_1$ ) range from -140% to -114%,  $\delta D_2$  vary from 136% to -116%, and  $\delta D_3$  between -126% and -103%. Gas samples with the characteristics of  $\delta D_1 > \delta D_2 < \delta D_3$  account to 60% of the total number.

All the gas samples are of thermogenic gas based on the  $C_1/C_{2+3} - \delta^{13}C_1$  correlation (correlation diagram source from [1]), and distribute between type II kerogen and type III kerogen area, indicating that gas preserved in Jialingjiang Fm was mixed, and the mixture of gases generated from two type kerogens caused the reversion of the carbon isotope series and the hydrogen isotope series. Ethane carbon isotope is often used to identify source rock's (kerogen's) type, and it is believed that carbon isotope value of ethane of the type II kerogen is less than -29% [2]. The gas reservoired in Jialingjiang Fm were mainly derived from type II kerogen based on the analysis of ethane carbon isotopes. Gas preserved in Low Permian Maokou Fm was studied to be generated from the carbonate strata of Lower Permian [3-4]. Gas preserved in Jialingjiang Fm is similar to the gas reservoired in the Maokou Fm in the composition of carbon isotopes, but the former is a little heavier than the latter. Gas resevoired in Jialingjiang Fm was mainly generated from type II kerogens of Lower Permian and mixed by the gas derived from type III kerogen of Upper Permian Longtan Fm.

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## The phase equilibrium of ternary system Cd<sup>2+</sup>, Na<sup>+</sup>//Cl<sup>-</sup>-H<sub>2</sub>O at 298 K

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Solid- Liquid Equilibrium of ternary system Cd<sup>2+</sup>. Na<sup>+</sup>//Cl<sup>-</sup>-H<sub>2</sub>O at 298 K were studied by an isothermal solution saturation method. Experimental results indicate that there are three univariant curves AE, EF and FB, two invariant point s E, F, and three crystallization fields in the quaternary system. The quaternary system has one double salt Na<sub>2</sub>CdCl<sub>4</sub>·3H<sub>2</sub>O. The crystallization zones of equilibrium solid phases are CdCl<sub>2</sub>·H<sub>2</sub>O (AEC field), Na<sub>2</sub>CdCl<sub>4</sub>·3H<sub>2</sub>O (EFM field) and NaCl (BDFfield), respectively. The composition of the invariant point E is CdCl<sub>2</sub>·H<sub>2</sub>O and Na<sub>2</sub>CdCl<sub>4</sub>·3H<sub>2</sub>O of which content was 52.70% and 4.11%, respectively. The composition of the invariant point F is Na<sub>2</sub>CdCl<sub>4</sub>·3H<sub>2</sub>O and NaCl of which content was 27.92% and 14.95%, respectively. The physicochemical properties of solution in the quaternary system show regular changes along with the increased cadmium concentration. The results indicated that CdCl<sub>2</sub>·H<sub>2</sub>O possessed the highest solubility among those three salts, which means a strong transfer of Cd ion and a high pollution risk of soil environment. And the solubility of NaCl would be restrained as the salts existing together.

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