Composition of closed-system Fischer-Tropsch synthesis gases and the constraint factors

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Closed-system Fischer–Tropsch synthesis was conducted at 350◦C and 380◦C under 30 MPa and 390◦C under 30, 100, and 200 MPa, respectively, with magnetite as a catalyst in this Study. The results of carbon isotope compositions of gaseous hydrocarbons were derived, which do not show an expected reversed order in carbon isotope composition from C_1 to C_3 hydrocarbons, even though features of partially reversed order in carbon isotope values, such as $\delta^{13}C_1>\delta^{13}C_2<\delta^{13}C_3$(Fig.1a), can still be commonly observed. In addition, the synthesis time, temperature, and pressure have a significant impact on the chemical and carbon isotopic compositions of abiogenic gases(Fig.1b). However, the essential constraint factor for the carbon isotopic features of abiogenic gases is the molar ratio of H_2/CO_2(Fig.1c). These results indicate that the reversed order of carbon isotope composition is not a unique criterion that can be typically used to distinguish abiogenic gases.

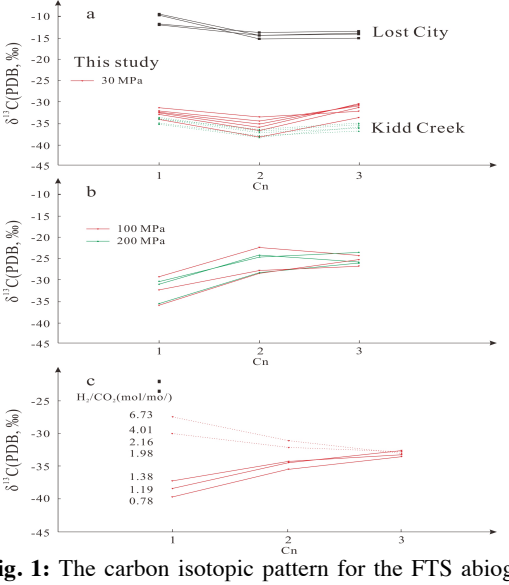

Fig. 1: The carbon isotopic pattern for the FTS abiogenic gases in a closed system.