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The filling time sequence of mantle CO_2 and hydrocarbon in Southern Songliao Basin: dawsonite-bearing sandstone evidence

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The filling time of mantle CO_2 in sedimentary basin is the basement of carrying out the research on interaction of CO_2-sandstone, as well as CO_2-crude oil. In general, the age of the volcanic rocks eruption occurred in the vicinity of the CO_2 pool is supposed to be the filling time of mantle CO_2. But this approach is obviously not suitable to the case of possessing multi volcanic activities. Two stages of hydrocarbon filling and single stage CO_2 filling have been interpreted in Southern Songliao basin, through the systematic observation/analysis of diagenetic sequence and fluid inclusions in the dawsonite-bearing sandstone. The two stages of hydrocarbon fillings were presented by the different occurrence of the liquid hydrocarbon inclusion and gas-liquid hydrocarbon inclusion founded in the authigenic minerals and fractures developed in detrital minerals. The filling records of mantle CO_2 were preserved in the form of dawsonite and CO_2-bearing inclusion developed in the fractures of detrital minerals. The filling time of mantle CO_2 is slightly later than that of second stage of hydrocarbon, or they are almost synchronously. As the injection of mantle CO_2 lead to the formation of authigenic carbonate minerals like dawsonite and ankerite, the injecting time of mantle CO_2 into Songliao basin has been proved to be probably the end of Cretaceous (end of Mingshui period) –Tertiary, according to the analysis of diagenetic sequence and liquid inclusions in dawsonite-bearing sandstone. Also the conclusion is consistent with the time of hydrocarbon filling and structural fractures developing that are obtained by other workers. Results of this work will be useful for understanding the sequence between volcanic activity, mantle CO_2 injection and mineral carbonation in Songliao basin, and be the implication for manual CO_2 injection. This work was supported by Key Development Plan of Science and Technology Project of Jilin Province in China (No. 20110426) and National Natural Science Foundation of China (No. 41172091).