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## Determination of oil charge timing in the Ordovician carbonate reservoir of the Tahe Oilfield, Tarim Basin, NW China

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Determining the timings of oil charge in sedimentary basins are essential to understand the evolutionary histories of petroleum systems, especially in sedimentary basins with complicated tectonic evolution and thermal histories. The Ordovician carbonate reservoir in the Tahe Oilfield, which is located in the northern Tarim Basin, comprises the largest marine reservoirs in China with reserves up to  $3.2 \times 10^8$  t. This study aims to determine the timings of oil charge in the Ordovician carbonate reservoir in the Tahe Oilfield, Tarim Basin, which basin is subjected to multiple phases of tectonic deformations and oil charge. The phases of calcite veins that contain oil inclusions were systematically investigated by cathodoluminescence observation, in situ rare earth element, C, O, and Sr isotope analyses. The homogenization temperatures of aqueous inclusions that are coeval with oil inclusions were measured to determine the timings of oil charge by combining the burial and geothermal histories. Two phases of calcite veins were judged by the differences in cathodoluminescence color, Ce anomaly,  $\delta^{18}\text{O}$ , and  $^{87}\text{Sr}/^{86}\text{Sr}$  values, which might be caused by variations in the water-rock interaction processes during different calcite phases. Primary oil inclusions with yellow fluorescence were observed in the two phases of calcite veins, suggesting two phases of oil charge. By combining the homogenization temperatures of aqueous inclusions with the burial and geothermal histories, the timing of phase I oil charge was inferred to be 336–312 Ma, and the timing of phase II oil charge was inferred to be 237–217 Ma.