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Quantitative characterization of crude oil cracking pressurization in the south of transition zone of Aman, Tarim Basin

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The overpressure has a significant effect on hydrocarbon migration and accumulation. Scholars have gradually focused on the quantitative characterization of overpressure, which proposes many overpressure quantitative models suitable for different overpressure mechanisms. However, there are few studies on quantitative characterization of overpressure in crude oil cracking. In view of this, taking the south of Aman transition zone in Tarim Basin as the research object, recovered the overpressure characteristics of the research area in the reservoir forming period, and established the quantitative model of crude oil cracking pressurization.

Firstly, according to the data about fluid inclusions tested by some experimental apparatus, the paleo-pressures were calculated by PVTx simulation method and basin simulation method. Next, based on the volume increment of crude oil cracking is equal to the volume reduction caused by overpressure compression, established the quantitative model for pressurization of total crude oil cracking. Moreover, equaled to the mass of residual oil plus the quality of cracked gas and pyrobitumen, put forward the quantitative model for pressurization of partial crude oil cracking and proposed these two model combined with some parameters, which included density and compressibility of oil, gas, water and pyrobitumen and conversion rate of crude oil cracking and so on. Then, using these two models, calculated the intensity of pressurization of Shunnan gas reservoir. At last, the accuracy of the model was tested by restored paleo-pressure values.

The study shows that the southwest of Shunnan slope is a typical overpressure area. The formation pressure coefficients of Yijianfang formation and Yingshan formation are between 1.15 and 1.48, and those of Penglaiba formation are as high as 1.94. Based on the homogenization temperature of the inclusions and combined with burial history and thermal history, the paleo-pressure in Shunnan is restored through fluid inclusion method. There were two periods of overpressure in Cisuralian (292-280ma) and Neogene (21-2ma). The paleo-pressure coefficient of Neogene is 1.57-1.64, which is generally higher than that of Cisuralian(1.39-1.48). The main mechanism of overpressure in Shunnan area is the cracking of crude oil and the author tried to establish the quantitative characterization of crude oil cracking. The overpressure of crude oil cracking during Neogene reaches around 30 MPa, of which the contributions is respectively 66.7 %.