

DIAMONDOIDS AND THIADIAMONDOIDS CONCENTRATIONS AS INDEX TO DESCRIBE DIFFERENT TYPE OILS SUFFERED SECONDARY ALTERATION

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Introduction

With exploration moving to the deep strata, a series of petroleum exploration breakthroughs, including commercial Jinyue and Yueman oilfields of Petrochina and North Shuntuoguole oilfield of Sinopec, have been discovered in the ultra-deep Ordovician in the Tarim Basin, NW China. Moreover, Zhongshen 1 (ZS1) and Zhongshen 1C wells (ZS1C) first obtained oil and gas breakthrough in the Cambrian pre-salt in the Tarim Basin. Due to the relatively high temperature and pressure in the deep strata, the secondary alterations of the deep oil reservoir, especially thermal cracking and thermochemical sulphate reduction (TSR), have been attracted more attention in recent years.

Due to a type of cage compounds, the diamondoids and thiadamondoids were used to assess oil cracking and thermochemical sulphate reduction (TSR) (Dahl et al., 1999; Wei et al., 2012). The geochemical characteristics of the oils from Shuntuoguole oilfield (including Shunbei 1, Shunnan1, Shuntuo 1), Luosi 2, ZS1 and ZS1C wells was described in order to evaluate different type of secondary alteration.

Results

According the concentrations of diamondoids and thiadamondoids, four types of oils suffered different secondary alteration can be divided:

Type A oil : suffered little thermal alteration and TSR, including the oils from Shunbei 1, Zhong 12CX, Shunxi 101, Zhongliang 1, and ZS1. Both the diamondoids and thiadamondoids are relatively low. For example, the diamondoids concentrations (adamantanes and diamantanes) of oils from Shunbei 1 wells range from 768 to 1127 ppm. The thiadamondoid concentrations of the oils were from 7~10 ppm (Fig.1), suggesting no TSR occurring.

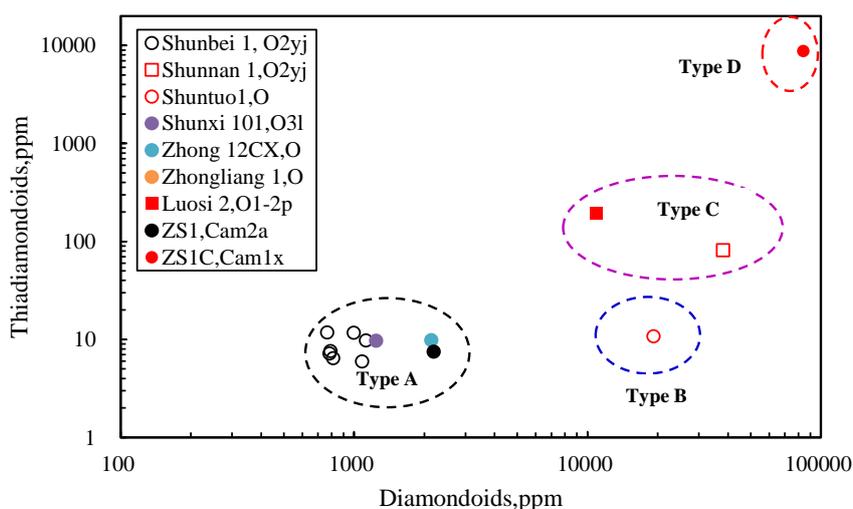


Figure 1 The relationship between the concentration of diamondoids and thiadamondoids of oils in the Tarim Basin, NW China.

Type B oil: suffered serious thermal alteration without TSR, including the oils from Shuntuo 1 well. The diamondoids concentration of Shuntuo 1 well is 19188ppm, whereas the thiadiamondoids concentration is only about 10.71 ppm.

Type C oil: suffered thermal alteration and TSR, including the oils from Shunnan 1 and Luosi 2 wells. These oils have both relatively higher diamondoids and thiadiamondoids concentration.

Type D oil: suffered serious TSR alteration. Only ZS1C oil of type D has been discovered in the Tarim Basin. Both diamondoids and thiadiamondoids concentration are the highest. Higher thiadiamondoids and diamondoidthiols have been detected in the oil, further support the oil is a product of severe TSR alteration (Ma et al., 2018).

Conclusions

The diamondoids and thiadiamondoids concentrations are the best parameters describing the thermal alteration and TSR alteration for the deep oil reservoirs. At least four type oil suffered different secondary alteration in the oils of Tarim Basin can be divided.

References

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