Supplementary file

Microscopic insights into CO_2-shale oil miscibility via interaction energy coupling pore confinement: Implications for CO_2-enhanced oil recovery

Xinran Yu[1,2], Haixin Dong[2], Yuxing Li[1,2,*], Cuiwei Liu[1,2], Linyang Zhang[3], Zhangxing Chen[4,5]

[1] *Shandong Provincial Key Laboratory of Oil, Gas and New Energy Storage and Transportation Safety, China University of Petroleum (East China), Qingdao 266580, P. R. China*

[2] *College of Pipeline and Civil Engineering, China University of Petroleum (East China), Qingdao 266580, P. R. China*

[3] *Key Laboratory of Industrial Fluid Energy Conservation and Pollution Control of the Ministry of Education, Qingdao University of Technology, Qingdao 266520, P. R. China*

[4] *Chemical and Petroleum Engineering, University of Calgary, Calgary, Alberta T2N1N4, Canada*

[5] *Eastern Institute of Technology, Ningbo 315200, P. R. China*

E-mail address: joyyu94@163.com (X.Yu); dong620xin@163.co m (H. Dong); lyxupc@163.com (Y. Li); chuyunlcw@163.com (C. Liu); linyang1412@yeah.net (L. Zhang); zhachen@ucalgary.ca (Z. Chen)

[*] Corresponding author (ORCID: 0000-0001-6035-1206 (Y. Li)

Yu X., Dong, H., Li, Y., Liu, C., Zhang, L., Chen, Z. Microscopic insights into CO_2-shale oil miscibility via interaction energy coupling pore confinement: Implications for CO_2-enhanced oil recovery. Advances in Geo-Energy Research, 2025, 17(2): 107-120.

The link to this file is: https://doi.org/10.46690/ager.2025.08.03

The MMPs calculated using the proposed method in this study at 363 K for pore sizes of 3, 5 and 10 nm are 9.83, 8.81 and 10.62 MPa, respectively (Fig. S1). These results are all higher than those obtained at 343 K (Fig. S2), and the MMPs within pores are generally lower than those under bulk condition. However, a continuous decrease with decreasing pore size is not observed.

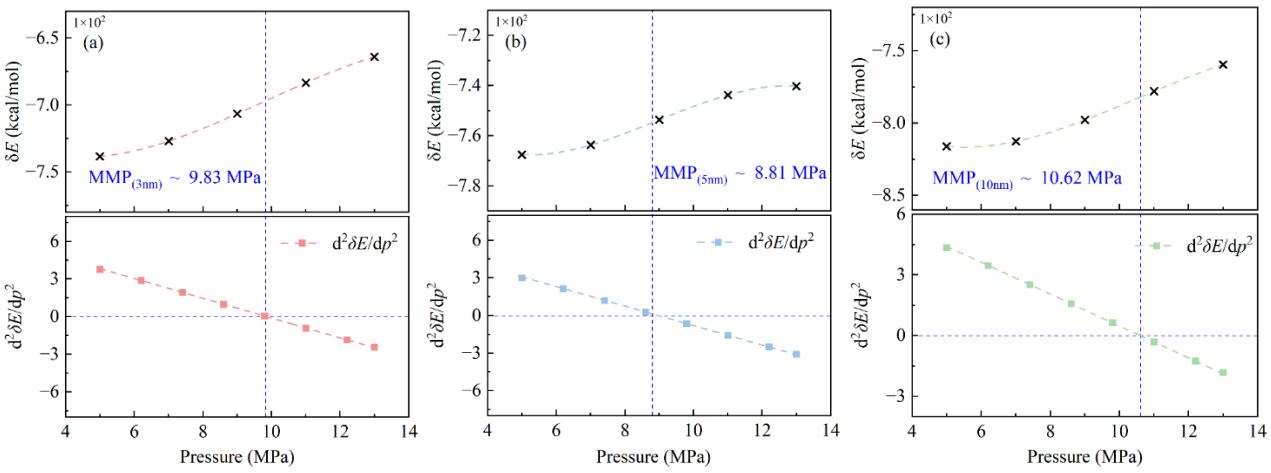

Fig. S1. δE and $\mathrm{d}^2\delta E/\mathrm{d}p^2$ versus pressure at 343 K. (a) 3 nm, (b) 5nm and (c) 10nm.

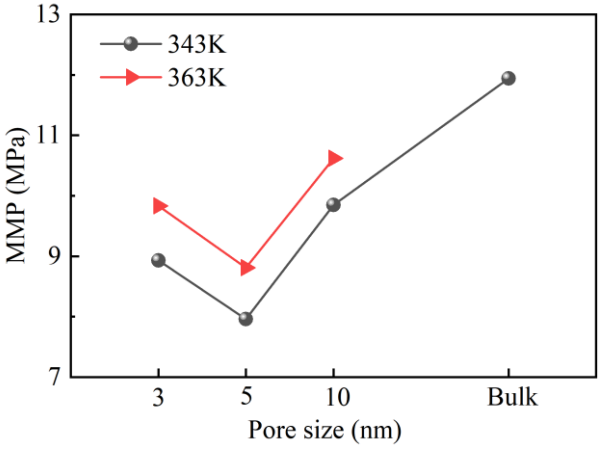

Fig. S2. MMP under conditions of different pore sizes and temperatures.