

**supplementary information**

**CO<sub>2</sub>/water two-phase flow in a two-dimensional micromodel of heterogeneous pores and throats**

Yu Liu<sup>a,\* †</sup>, Pengfei Lv<sup>a,\*</sup>, Yao Liu<sup>b</sup>, Lanlan Jiang<sup>a</sup>, Suekane Tetsuya<sup>b</sup>, Yongchen Song<sup>a, †</sup>, Bohao Wu<sup>a</sup>, Shuyang Liu<sup>a</sup>

<sup>a</sup>Key Laboratory of Ocean Energy Utilization and Energy Conservation of Ministry of Education, Dalian University of Technology, Dalian 116024, China.

<sup>b</sup>Department of Energy Sciences, Tokyo Institute of Technology, 4259-G3-31 Nagatsuta, Yokohama, Japan.

\*These two authors contributed equally to this work and should be considered as co-first authors.

†Corresponding authors: liuyu@dlut.edu.cn, songyc@dlut.edu.cn

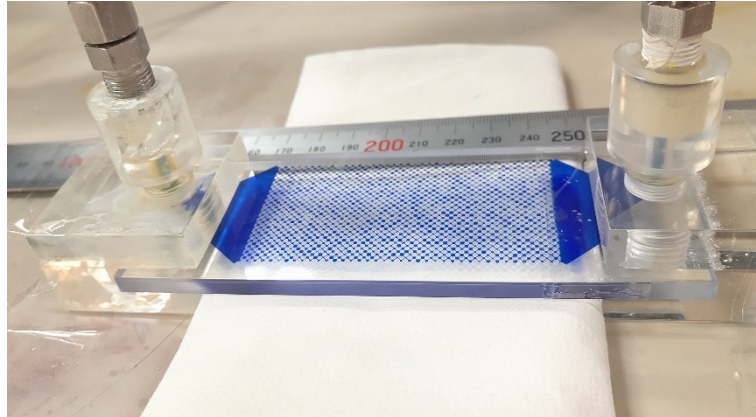


Fig. S1 The micromodel was fixed by two holders and CO<sub>2</sub>/water was also injected into the micromodel through the holder.

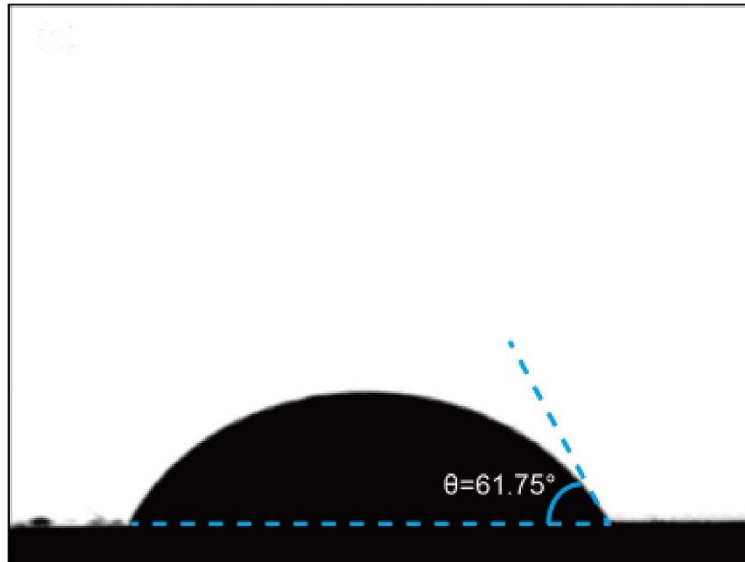


Fig. S2 Contact angle measurement using sessile drop method at 25 °C and ambient pressure conditions.

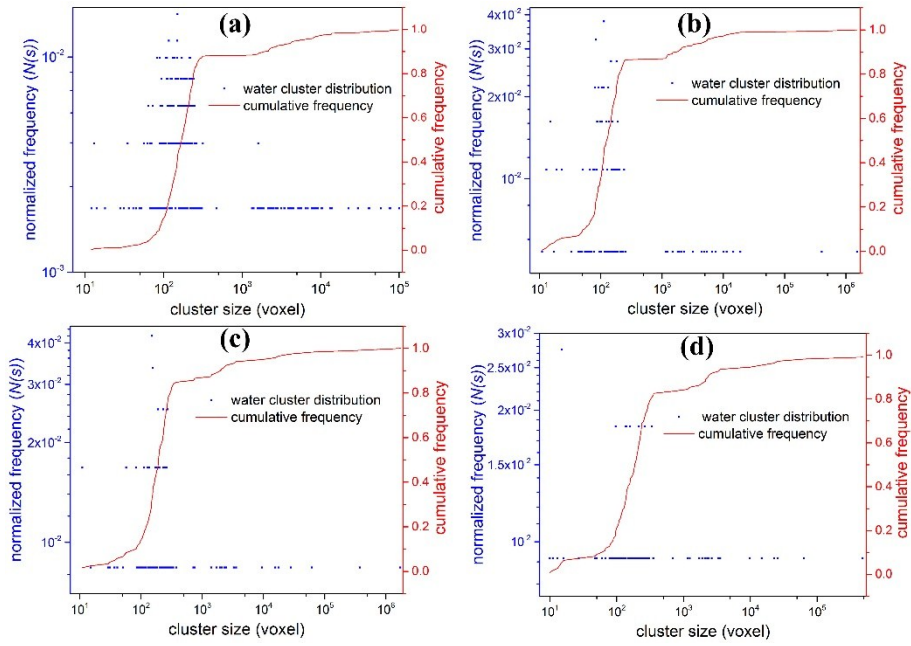


Fig. S3 Frequency and cumulative frequency distribution of water cluster at (a) 0.2 ml/h, (b) 0.4 ml/h, (c) 0.5 ml/h and (d) 6 ml/h in vertical drainage.

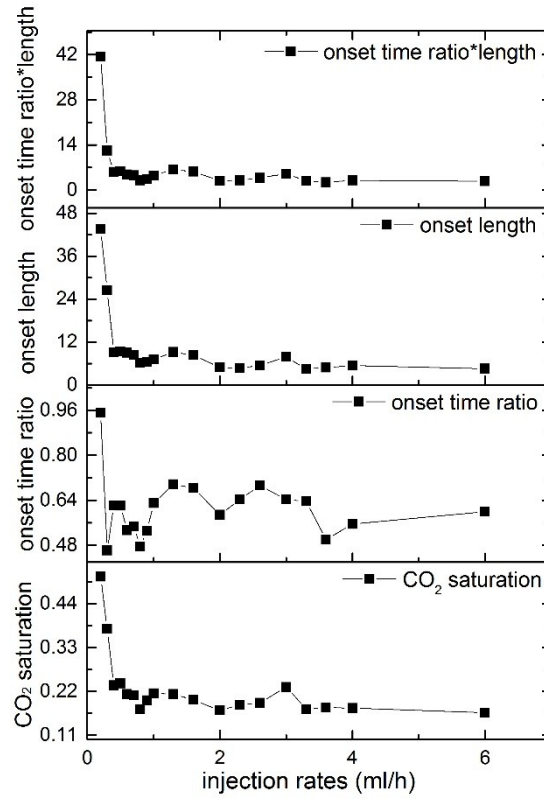


Fig. S4 A comparison among  $CO_2$  saturation, onset time ratio  $T_{onset\_ratio}$ , onset length  $L_{onset}$ , and  $S_{eval}$  in vertical drainage.