

Table S1. Properties of the sand used for flooding experiments conducted in this study.

U.S. Sieve	Approximate Diameter (mm)	Percent Retained
40 Mesh	0.422	2 %
50 Mesh	0.297	28 %
70 Mesh	0.211	38 %
100 Mesh	0.152	21 %
140 Mesh	0.104	8 %
200 Mesh	0.075	2 %
270 Mesh	0.053	1 %

Table S2. Physical properties of the oil sample used in this study at $P_{atm} = 101.1$ kPa and $T = 25^{\circ}\text{C}$.

Property	Value
Molecular weight	223 gr/mol
Density @ 101.1 kPa & 25 °C	799 kg/m ³
API Density	44.1 °API
Viscosity @ 101.1 kPa & 25 °C	2.76 mPa.s
<i>n</i> -C5 insoluble asphaltene	1.23 wt.%

Table S3. Experimental conditions, characteristics of the unconsolidated sand-packs, and flooding specifications for the conventional WF and ten CWI tests conducted in this study.

Test	Mode	CL (%)	P (MPa)	T (°C)	q_{inj} (cm ³ /min)	χ in Brine (mole/kg)	k_{abs} (mD)	ϕ (%)	S_{wi}	S_{or}
#1	WF	-	4.1	25	1.0	-	5608	27.84	0.384	0.248
#2	SCWI	100	0.7	25	1.0	0.1354	6715	27.91	0.365	0.238
#3	SCWI	100	1.4	25	1.0	0.3572	7190	27.32	0.363	0.226
#4	SCWI	100	2.8	25	1.0	0.7737	7047	27.39	0.371	0.201
#5	SCWI	100	4.1	25	1.0	0.9738	7184	27.58	0.365	0.181
#6	SCWI	100	5.5	25	1.0	1.2523	4320	28.84	0.385	0.155
#7	SCWI	100	6.9	25	1.0	1.3084	4487	27.13	0.365	0.150
#8	SCWI	100	10.3	25	1.0	1.3188	4322	26.61	0.373	0.136
#9	SCWI	100	4.1	40	1.0	0.7797	4320	27.13	0.385	0.186
#10	SCWI	100	4.1	25	0.5	0.9738	7105	27.65	0.372	0.177
#11	SCWI	50	4.1	25	1.0	0.4869	4011	26.54	0.368	0.207

Table S4. Calculated average absolute and relative deviations for the CO₂ solubility values in brine and oil at experimental temperatures of $T = 25$ and 40 °C.

	Temperature, °C	Average Absolute Deviation	Average Relative Deviation
CO ₂ Solubility in Brine	25	0.04 Mole CO ₂ /kg brine	11.5 %
	40	0.03 Mole CO ₂ /kg brine	4.9 %
CO ₂ Solubility in Oil	25	1.30 gr CO ₂ /100gr Oil	14.8 %
	40	1.03 gr CO ₂ /100gr Oil	11.5 %

Table S5: Ultimate RF, RF at breakthrough time, and RF improvement for eight sand-pack flooding experiments conducted at various operating pressures and constant temperature of $T = 25\text{ }^{\circ}\text{C}$.

Test	Mode	P (MPa)	RF @ Water BT (%)	Ultimate RF (%)	RF Improvement* (%)
#1	WF	4.1	57.14	59.74	-
#2	SCWI	0.7	57.67	62.48	2.74
#3	SCWI	1.4	57.00	64.55	4.81
#4	SCWI	2.8	57.48	67.99	8.25
#5	SCWI	4.1	56.98	71.51	11.77
#6	SCWI	5.5	59.77	74.81	15.07
#7	SCWI	6.9	60.54	76.43	16.69
#8	SCWI	10.3	58.78	78.76	19.02

Notes:

* RF improvement is taken as the difference between RF for base case conventional WF and that for each CWI test.

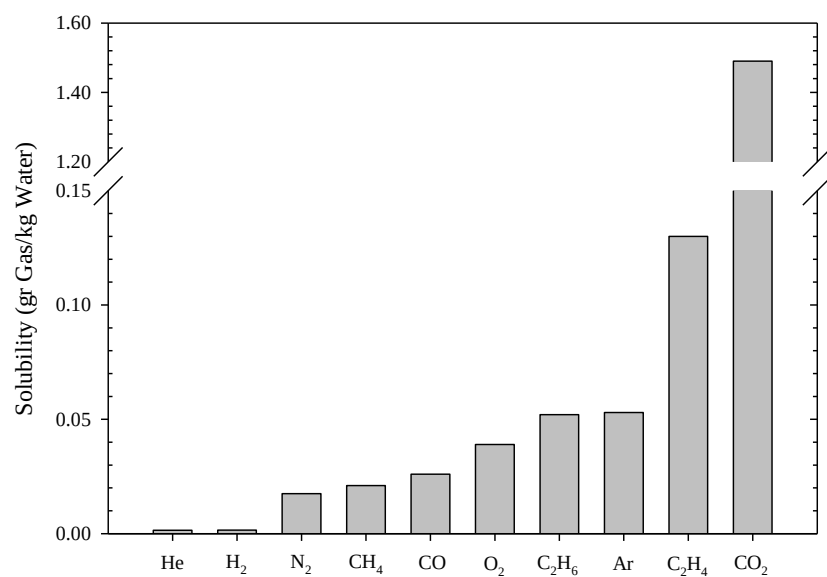


Figure S1. Solubility of different gases in pure water at pressure of $P = 101.3$ kPa and temperature of $T = 25$ °C.