**Supplementary material**

**The Elimination of Arsenic from Natural Gas Condensate via** **Pulse Sieve-Plate Column: Experimental and Application of DFT for Chemical Structure.**

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1. Effect of the Sauter mean diameter on dispersion coefficient

**Table S1** Correlation between the Sauter mean diameter (d32) and the interfacial area.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Af | d32 (Sreenivasulu et al., 1997) | Surface Area(d32)/ 1 drop | Volume(d32)/ 1 drop | Volumn of drop/1L | Amount drop/1L | Interficial Area/ 1 L |
| (m/s) | (m) | (m2) | (m3) | (m3) | (drops) | (m2) |
| 0.004 | 0.006948 | 0.0001517 | 0.000000175641 | 5,693,420 | 5,693 | 0.86 |
| 0.008 | 0.003991 | 0.0000500 | 0.000000033278 | 30,050,051 | 30,050 | 1.50 |
| 0.012 | 0.002885 | 0.0000262 | 0.000000012576 | 79,517,778 | 79,518 | 2.08 |
| 0.016 | 0.002292 | 0.0000165 | 0.000000006305 | 158,605,120 | 158,605 | 2.62 |
| 0.020 | 0.001917 | 0.0000115 | 0.000000003691 | 270,957,536 | 270,958 | 3.13 |
|  |  |  |  |  |  |  |

1. Influence of flowrate ratio on arsenic extraction

**Table S2** Correlation between the flowrate ratio and the volume ratio of feed/extractant.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Feed flowrate (mL/min) | 55 | 55 | 55 | 55 | 55 | 110 | 165 | 220 | 275 |
| Extract flowrate (mL/min) | 275 | 220 | 165 | 110 | 55 | 55 | 55 | 55 | 55 |
| Flowrate Ratio (Feed/Extractant) | 0.20 | 0.25 | 0.33 | 0.50 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 |
| Sum flowrate (Feed+Extractant) | 330 | 275 | 220 | 165 | 110 | 165 | 220 | 275 | 330 |
| Retention time of sum flowrate (min) | 11.30 | 13.56 | 16.95 | 22.61 | 33.91 | 22.61 | 16.95 | 13.56 | 11.30 |
| Feed volume in column (mL) | 622 | 746 | 933 | 1243 | 1865 | 2487 | 2798 | 2984 | 3108 |
| Extract volume in column (mL) | 3108 | 2984 | 2798 | 2487 | 1865 | 1243 | 933 | 746 | 622 |
| Ratio of Feed volume in column | 0.17 | 0.20 | 0.25 | 0.33 | 0.50 | 0.67 | 0.75 | 0.80 | 0.83 |
| Ratio of Extract volume in column | 0.83 | 0.80 | 0.75 | 0.67 | 0.50 | 0.33 | 0.25 | 0.20 | 0.17 |

1. The order of reaction on extraction



**S1**



**S2**



**S3**

**Fig. S1, S2 and S3** Order of reaction: in terms of solute concentration versus time.

1. Effect of pulsation intensity on Sauter mean diameter



**Fig. S4** Influence of pulsation intensity (Af) on the Sauter mean diameter (d32) calculated using Eq. 9 and Eq. 10: concentration of methanol (5M), concentration of hydrochloric acid (1 M), feed and extract flowrate (55 ml/min), pulse velocity (4, 8, 12, 16 and 20 mm/sec), extraction time (240 min). The flow is continuous and counter current to each other.