**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.