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| **ZEROBRINE\_D3.2\_DATA\_EFCCOMPOSITION\_v0.1** | | **The composition of liquid samples collected during the EFC experiments on synthetic solutions** | | | | | | | |
| Researchers: | Krzysztof Mitko, Panagiotis Alexopoulos, Sirous Ebrahimi, Dimitris Xevgenos | | | | Date: | | | October 2019 | |
| Equipment: | 2L bench-scale eutectic freeze crystallizer (equipment BCr-1 from the Dutch BEC) equipped with Hei-TORQUE Precision 400 stirrer and LAUDA PROLINE KRYOMAT RP 4090 CW cooling bath. | | | | | | | | |
| Protocol: | A 2 L sample of each of the synthetic brine solutions (denoted as Feed 1, 2, and 3 – see Tab. 1) were fed to a batch-mode eutectic freeze crystallizer equipped with mechanical stirrer (70 rpm) and a cooling jacket connected to an external cooler. The temperature inside was gradually lowered. After the eutectic point was reached, which was detected by lack of temperature change inside the reactor despite lowering the coolant temperature, ice crystals were added to the reaction mixture to precipitate/confirm ice crystals forming inside. When the occurrence of eutectic crystallization was confirmed, samples of salt crystals, ice, and post-crystallization lyes were collected. The salt crystals were subjected to vacuum filtration and washed with 26.4% w/w sodium chloride solution. The filtrate from each washing was collected. The concentration of sodium, calcium, and magnesium was determined using ICP-MS method, whereas the concentration of chlorides and sulfates was determined by ion chromatography.  Tab. 1. The composition of synthetic brines used in EFC tests   |  |  |  |  | | --- | --- | --- | --- | |  | Feed 1 | Feed 2 | Feed 3 | | Cl- [g/dm3] | 180 | 180 | 180 | | Mg2+ [g/dm3] | 2.14 | 1.12 | 0.033 | | Ca2+ [g/dm3] | 6.97 | 2.97 | 0.035 | | SO42- [g/dm3] | 0.507 | 0.264 | 0.277 | | | | | | | | | |
| **Ionic composition of the collected samples** | | | | | | | | | |
| Sample | | | Concentration [g/L] | | | | | | |
| Na+ | Cl- | | SO42- | Ca2+ | | Mg2+ |
| Feed 1, initial brine | | | 155.7 | 204.1 | | 0.458 | 8.316 | | 2.903 |
| Feed 1, post-crystallization lye | | | 153.0 | 185.7 | | 0.513 | 12.163 | | 3.342 |
| Feed 2, initial brine | | | 169.5 | 209.0 | | 0.219 | 4.484 | | 1.675 |
| Feed 2, filtrate before washing | | | 152.0 | 193.4 | | 0.227 | 4.136 | | 1.749 |
| Feed 2, filtrate after 1st washing with saturated NaCl | | | 180.1 | 220.3 | | <0.002 | 2.530 | | 0.364 |
| Feed 2, filtrate after 2nd washing with saturated NaCl | | | 186.0 | 224.0 | | <0.002 | 1.213 | | 0.141 |
| Feed 2, filtrate after 3rd washing with saturated NaCl | | | 187.0 | 227.0 | | <0.002 | 0.274 | | 0.070 |
| Feed 3, initial brine | | | 166.0 | 207.3 | | 0.230 | 1.142 | | 0.082 |
| Feed 3, filtrate before washing | | | 159.8 | 194.2 | | 0.244 | 1.619 | | 0.084 |
| Feed 3, filtrate after 1st washing with saturated NaCl | | | 177.4 | 218.2 | | 0.039 | 1.133 | | 0.061 |
| Feed 3, filtrate after 2nd washing with saturated NaCl | | | 186.2 | 220.1 | | <0.002 | 1.158 | | 0.051 |