## Work Request 78734: High Temperature Stability Tests of Water Tracers at 250°C

### Aim

This test is to determine which water tracers are thermally stable after 48 hours at 250°C.

### Procedure

15 water tracers were subjected to 250°C for 48 hours to test for their thermal degradation. Groups of tracers were combined into a common solution based on their retention time by HPLC analysis. The tracers in each group were chosen such that they had at least 0.2 minutes difference in retention time. The concentration of each tracer in a common tracer solution was ~400 ppm w/w. All solutions were prepared in synthetic produced water (5% NaCl solution). A portion of each tracer solution (100 g) was added to a Parr reactor and subjected to 250°C for 48 hours. The remainder of each tracer solution was stored at room temperature.

Tracer solutions were analysed by HPLC: the tracer response from solutions subjected to 250°C were expressed as a percentage versus the response from the same solution kept at room temperature. A tracer passed the test if it retained >90% of its original concentration.

### Results

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Tracer | HTP-001 | HTP-002 | HTP-003 | HTP-004 | HTP-005 | HTP-006 | HTP-007 | HTP-008 |
| Percentage of initial concentration / % | 90.9 | 95.0 | 30.9 | 31.7 | 92.4 | 68.1 | 24.1 | 56.5 |
| **Tracer** | **HTP-0009** | **HTP-010** | **HTP-011** | **HTP-012** | **HTP-013** | **HTP-014** | **HTP-015** |  |
| Percentage of initial concentration / % | 71.6 | 74.6 | 79.5 | 79.8 | 78.2 | 21.3 | 84.3 |  |

Table 1: Percentage of initial concentration for each tracer after 48 hours at 250°C.

Tracer solutions were tested in duplicate in two Parr reactors. The results were averaged and are shown in Table 1.

Figure 1: Percentage of initial concentration for each tracer after 48 hours at 250°C. The orange line corresponds to the pass percentage of 90%.

Three tracers successfully retained >90% of their original concentration: HTP-001, HTP-002, HTP-005. The results of the test are shown in Table 2.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tracer | HTP-001 | | HTP-002 | | HTP-005 | |
|  | HTP001/1 | HTP001/2 | HTP006/1 | HTP006/2 | HTP009/1 | HTP009/2 |
| Day 0 concentration / ppm | 385.21 | 385.21 | 410.39 | 410.39 | 407.10 | 407.10 |
| Day 2 concentration / ppm | 356.44 | 343.75 | 395.01 | 395.01 | 381.70 | 370.27 |
| % of Initial Concentration | 92.53 | 89.24 | 96.25 | 93.65 | 93.76 | 90.95 |
| Average / % | 90.88 | | 94.95 | | 92.36 | |

Table 2: Experimental results for the four tracers which successfully passed the test.

### Conclusion

Three of the fifteen tracers retained >90% of their initial concentration after 48 hours at 250°C. All other tracers failed the test procedure. Further tracers have been identified as suitable test candidates.

The determination of the tracer passing the test has been solely determined by retention times of HPLC analysis. Further confirmation is possible by GC-MS but has not been undertaken at this time.