**Supplemental material**

**Table S1** Initial inventory of nuclides *A*i (Bq) and the half-life (days).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | Zr-9564.032 | Ru-10339.26 | I-1318.021 | Cs-13710965 | Ba-14012.75 |
| R01 | 1.22E+04 | 1.14E+04 | 2.80E+04 | 1.08E+02 | 4.03E+04 |
| R02 | 1.08E+04 | 1.04E+04 | 2.59E+04 | 9.03E+01 | 3.85E+04 |
| R03 | 1.04E+04 | 1.05E+04 | 2.51E+04 | 9.03E+01 | 3.66E+04 |
| R04 | 1.13E+04 | 1.10E+04 | 2.63E+04 | 9.18E+01 | 4.01E+04 |
| R05 | 1.01E+04 | 1.02E+04 | 2.57E+04 | 9.39E+01 | 3.72E+04 |
| R06 | 1.18E+04 | 1.17E+04 | 2.85E+04 | 1.04E+02 | 4.08E+04 |
| R07 | 1.08E+04 | 1.08E+04 | 2.66E+04 | 1.00E+02 | 3.99E+04 |
| R08 | 1.14E+04 | 1.19E+04 | 2.84E+04 | 1.08E+02 | 4.15E+04 |
| R09 | 9.83E+03 | 1.00E+04 | 2.40E+04 | 8.90E+01 | 3.57E+04 |
| R10 | 1.05E+04 | 1.06E+04 | 2.63E+04 | 9.71E+01 | 3.73E+04 |
| R11 | 9.93E+03 | 1.04E+04 | 2.50E+04 | 9.54E+01 | 3.65E+04 |
| R12 | 1.03E+04 | 1.11E+04 | 2.52E+04 | 9.78E+01 | 3.74E+04 |
| R13 | 1.11E+04 | 1.12E+04 | 2.64E+04 | 1.04E+02 | 4.02E+04 |
| R14 | 1.06E+04 | 1.14E+04 | 2.63E+04 | 1.02E+02 | 3.89E+04 |
| O01 | 1.08E+04 | 1.13E+04 | 2.52E+04 | 9.09E+01 | 3.96E+04 |
| O02 | 1.08E+04 | 1.14E+04 | 2.54E+04 | 8.96E+01 | 3.86E+04 |
| O03 | 1.13E+04 | 1.17E+04 | 2.67E+04 | 1.01E+02 | 4.08E+04 |
| O04 | 9.93E+03 | 1.04E+04 | 2.50E+04 | 9.54E+01 | 3.65E+04 |
| O05 | 1.10E+04 | 1.20E+04 | 2.79E+04 | 1.09E+02 | 4.24E+04 |
| O06 | 1.12E+04 | 1.18E+04 | 2.76E+04 | 1.12E+02 | 4.08E+04 |
| O07 | 1.19E+04 | 1.21E+04 | 2.86E+04 | 1.12E+02 | 4.33E+04 |
| O08 | 1.11E+04 | 1.14E+04 | 2.66E+04 | 1.08E+02 | 3.93E+04 |
| O09 | 9.98E+03 | 1.03E+04 | 2.31E+04 | 8.52E+01 | 3.63E+04 |
| O10 | 1.05E+04 | 1.08E+04 | 2.51E+04 | 9.64E+01 | 3.75E+04 |
| O11 | 1.04E+04 | 1.11E+04 | 2.57E+04 | 1.05E+02 | 3.95E+04 |
| O12 | 1.05E+04 | 1.08E+04 | 2.42E+04 | 8.72E+01 | 3.67E+04 |
| O13 | 1.01E+04 | 1.06E+04 | 2.47E+04 | 9.54E+01 | 3.69E+04 |
| O14 | 1.05E+04 | 1.09E+04 | 2.56E+04 | 1.03E+02 | 3.80E+04 |

**T. Sasaki et al.**

**Supplemental material**

**Table S2** Summary of thermodynamic constants of uranium binary and ternary complexes

|  |  |
| --- | --- |
| Species(*m,p,q*) | log***m,p,q* |
| UIV*m* | (UVIO2)*m* |
| (OH)*p*(CO3)*q* | (OH)*p*(CO3)*q* |
| (1,1,0) | 13.5 [15] | 8.8 [15] |
| (1,2,0) | 26.9 [15] | 15.9 [15] |
| (1,3,0) | 37.3 [15] | 21.8 [15] |
| (1,4,0) | 46.0 [15] | 23.6 [15] |
| (2,1,0) | - | 11.3 [15] |
| (2,2,0) | - | 22.4 [15] |
| (3,4,0) | - | 44.1 [15] |
| (3,5,0) | - | 54.5 [15] |
| (4,7,0) | - | 76.1 [15] |
| (1,0,1) | - | 9.9 [15] |
| (1,0,2) | - | 16.6 [15] |
| (1,0,3) | - | 21.8 [15]  |
| (1,0,4) | 32.9 [14] | - |
| (1,0,5) | 34.0 [14] | - |
| (3,0,6) | - | 54.0 [15] |
| (2,3,1) | - | 41.1 [15] |
| Solid phase | log*K*sp |  |
| UO2 (cr) | -60.86 [15] |  |
| UO3·2H2O(s) | -23.19 [15] |  |

**T. Sasaki et al.**