

Thorium

| Reaction | Baes and Mesmer, 1976 | Rand et al., 2008 | Thoenen et al., 2014 | Brown and Ekberg, 2016 |
|---|-----------------------|-------------------|----------------------|------------------------|
| $\text{Th}^{4+} + \text{H}_2\text{O} \rightleftharpoons \text{ThOH}^{3+} + \text{H}^+$ | -3.20 | -2.5 ± 0.9 | -2.5 ± 0.5 | -2.55 ± 0.50 |
| $\text{Th}^{4+} + 2 \text{H}_2\text{O} \rightleftharpoons \text{Th}(\text{OH})_2^{2+} + 2 \text{H}^+$ | -6.93 | -6.2 ± 0.5 | -6.2 ± 0.5 | -6.05 ± 0.09 |
| $\text{Th}^{4+} + 3 \text{H}_2\text{O} \rightleftharpoons \text{Th}(\text{OH})_3^+ + 3 \text{H}^+$ | < -11.7 | | | -11.0 ± 1.0 |
| $\text{Th}^{4+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{Th}(\text{OH})_4 + 4 \text{H}^+$ | -15.9 | -17.4 ± 0.7 | -17.4 ± 0.7 | -17.2 ± 0.3 |
| $2 \text{Th}^{4+} + 2 \text{H}_2\text{O} \rightleftharpoons \text{Th}_2(\text{OH})_2^{6+} + 2 \text{H}^+$ | -6.14 | -5.9 ± 0.5 | -5.9 ± 0.5 | -5.79 ± 0.12 |
| $2 \text{Th}^{4+} + 3 \text{H}_2\text{O} \rightleftharpoons \text{Th}_2(\text{OH})_3^{5+} + 3 \text{H}^+$ | | -6.8 ± 0.2 | -6.8 ± 0.2 | -6.64 ± 0.13 |

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| $4 \text{ Th}^{4+} + 8 \text{ H}_2\text{O} \rightleftharpoons \text{Th}_4(\text{OH})_8^{8+} + 8 \text{ H}^+$ | -21.1 | -20.4 ± 0.4 | -20.4 ± 0.4 | -20.41 ± 0.08 |
| $4 \text{ Th}^{4+} + 12 \text{ H}_2\text{O} \rightleftharpoons \text{Th}_4(\text{OH})_{12}^{4+} + 12 \text{ H}^+$ | | -26.6 ± 0.2 | -26.6 ± 0.2 | -26.6 ± 0.2 |
| $6 \text{ Th}^{4+} + 14 \text{ H}_2\text{O} \rightleftharpoons \text{Th}_6(\text{OH})_{14}^{10+} + 14 \text{ H}^+$ | | -36.8 ± 1.2 | -36.8 ± 1.2 | -36.8 ± 0.5 |
| $6 \text{ Th}^{4+} + 15 \text{ H}_2\text{O} \rightleftharpoons \text{Th}_6(\text{OH})_{15}^{9+} + 15 \text{ H}^+$ | -36.76 | -36.8 ± 1.2 | -36.8 ± 1.5 | -37.5 ± 0.2 |
| $\text{ThO}_2(\text{c}) + 4 \text{ H}^+ \rightleftharpoons \text{Th}^{4+} + 2 \text{ H}_2\text{O}$ | 6.3 ± 0.5 | | | |
| $\text{ThO}_2(\text{am}) + 4 \text{ H}^+ \rightleftharpoons \text{Th}^{4+} + 2 \text{ H}_2\text{O}$ | | | | 8.8 ± 1.0 |
| $\text{ThO}_2(\text{am,hyd,fresh}) + 4 \text{ H}^+ \rightleftharpoons \text{Th}^{4+} + 2 \text{ H}_2\text{O}$ | | | 9.3 ± 0.9 | |
| $\text{ThO}_2(\text{am,hyd,aged}) + 4 \text{ H}^+ \rightleftharpoons \text{Th}^{4+} + 2 \text{ H}_2\text{O}$ | | | 8.5 ± 0.9 | |
| $\text{Th}^{4+} + 4 \text{ OH}^- \rightleftharpoons \text{ThO}_2(\text{am,hyd,fresh}) + 2 \text{ H}_2\text{O}$ | | 46.7 ± 0.9 | | |
| $\text{Th}^{4+} + 4 \text{ OH}^- \rightleftharpoons \text{ThO}_2(\text{am,hyd,aged}) + 2 \text{ H}_2\text{O}$ | | 47.5 ± 0.9 | | |

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