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Standard potentials of the (MO_2^{2+}/MO_2^+) systems for uranium and other actinides

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The formal potentials of the (UO_2^{2+}/UO_2^+) couple has been determined in media of varying ionic strength. These data have been interpreted by using the Brönsted-Guggenheim-Scatchard specific ionic interaction theory (S.I.T.) to give the standard potential

$$E°(UO_2^{2+}/UO_2^+) = +0.089 \pm 0.002 \text{ V/NHE (at } I = 0)$$

and the interaction coefficient

$$\varepsilon(UO_2^+, ClO_4^-) = +0.28 \pm 0.04 \text{ kg.mol}^{-1}.$$

The applicability of the S.I.T. and other types of virial expansion (Debye-Hückel, Davies, Baes and Mesmer, Pitzer etc.) have also been discussed. A review of published data on the formal potentials of (UO_2^{2+}/UO_2^+), (NpO_2^{2+}/NpO_2^+), (PuO_2^{2+}/PuO_2^+) and (AmO_2^{2+}/AmO_2^+) couples has been made using the S.I.T. We found that all of the existing experimental determinations of formal potentials could be well described by the specific interaction theory with constant interaction coefficients $\varepsilon(MO_2^{2+}, ClO_4^-) = +0.46 \pm 0.02 \text{ kg.mol}^{-1}$ and $\varepsilon(MO_2^+, ClO_4^-) = +0.28 \pm 0.04 \text{ kg.mol}^{-1}$ for all actinides.