Stability of Pentavalent Plutonium. Spectrophotometric study of
PuO$_2^+$ and Pu$^{4+}$ disproportionations in perchloric media.

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The disproportionation constant of pentavalent plutonium into hexavalent and trivalent forms are determined at -lg[H$^+$] = 1, in perchloric media of varying ionic strength from 0.1 M to 3 M. These data are extrapolated to zero ionic strength using the Specific Interaction Theory in order to deduce the standard disproportionation constant and the interaction coefficient:

\[ \text{lg}K(V)^\circ = 2.6 \pm 0.5 \]
\[ \Delta \varepsilon = 0.09 \pm 0.1 \text{ (kg/mol).} \]

K(V)$^\circ$ temperature influence is estimated: PuO$_2^+$ is less stable when temperature is increased. The irreversible redox potentials of plutonium are then calculated using PuO$_2^{2+}$/PuO$_2^+$ and Pu$^{4+}$/Pu$^{3+}$ redox potentials and K(V)$^\circ$. The Pu$^{4+}$ formation from PuO$_2^{2+}$ and Pu$^{3+}$ in 1 M HClO$_4$ solution is also studied.

The results of this experiment and the previous ones are compared: they are consistent. Published work is also discussed.