SUPPORTING INFORMATION

Sonochemical Redox Reactions of Pu(III) and Pu(IV) in Aqueous Nitric Solutions

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Proposed mechanism for hydroxylamine formation:

In the presence of hydrazinium nitrate:

$$NH_2-NH_3^+ + HO^\circ + H^+ \rightarrow NH_2OH_2^+ + ^\circ NH_3^+$$

 $^{\circ}NH_{3}^{+} + H_{2}O \rightarrow NH_{4}^{+} + HO^{\circ}$

In the presence of sulfamic acid:

 $\mathsf{NH}_2\mathsf{SO}_3\mathsf{H} + \mathsf{HO}^\circ + \mathsf{H}^+ \longrightarrow \mathsf{NH}_2\mathsf{OH}_2^+ + {}^\circ\mathsf{SO}_3\mathsf{H}$

 $^{\circ}SO_{3}H + H_{2}O \rightarrow H_{2}SO_{3} + HO^{\circ}$

Figure S1: Sonolysis (20 kHz, Ar, 26°C, 0.52 W.mL⁻¹) of a ~10 mM Pu(III) solution in 1 M HNO₃ – 0.1 M $[N_2H_5][NO_3]$ evidencing its sonochemical oxidation to Pu(IV) with *in-situ* generated H₂O₂.



Figure S2: Regression evidencing the first order reaction mechanism observed for the sonochemical reduction of Pu(IV) in 1 M $HNO_3 - 0.1$ M NH_2SO_3H .



Figure S3: Comparison of $W_0(-Pu^{IV})$ and $W_0(H_2O_2)$ as a function of P_{ac} . Linear extrapolation for plutonium decrease allow to determine a P_{ac} threshold of 0.17 W.mL⁻¹ required to observe Pu(IV) reduction.



Figure S4: Regression evidencing the first order reaction mechanism observed for the sonochemical reduction of Pu(IV) in 1 M $HNO_3 - 0.1 M [N_2H_5][NO_3]$.



Figure S5: Comparison of Pu(IV) reduction and Pu(III) appearance in 1 M HNO₃ / 0.1 M [N₂H₅][NO₃] in the presence or absence of 0.1 M [N₂H₅][NO₃] under ultrasound (20 kHz, Ar, 0.52 W.mL⁻¹, 26°C) or stirring.

