

Vitamin C Boosts Ceria-Based Catalysts Recycling

Xavier Beaudoux^{1,2}, Matthieu Viot^{1,*}, Tony Chave¹, Grégory Durand³,
Gilles Leturcq², Sergey I. Nikitenko¹

¹ Institut de Chimie Séparative de Marcoule, ICSM-UMR5257 CNRS/CEA/UM/ENCSM, BP17171, F-30207 Bagnols sur Cèze, France

² CEA, Nuclear Energy Division, RadioChemistry & Processes Department, BP17171, F-30207 Bagnols sur Cèze, France

³ Institut des Biomolécules Max Mousseron (UMR 5247 CNRS-Université Montpellier-ENSCM) & Avignon University, Equipe Chimie Bioorganique et Systèmes Amphiphiles, 301 rue Baruch de Spinoza, F-84916 Avignon Cedex 9, France

[*matthieu.viot@cea.fr](mailto:matthieu.viot@cea.fr)

Figure S1: SEM pictures of studied oxides before dissolution. (a.) CeO₂ at 15 m².g⁻¹ (oxalate precursor fired at 600°C), (b.) CeO₂ at ~1 m².g⁻¹ (oxalate precursor fired at 1000°C), (c.) CeO₂ at 250 m².g⁻¹ (commercial), (d.) (Ce_{0.8}Tb_{0.2})O₂ at 30 m².g⁻¹ (oxalate precursor fired at 500°C), (e.) CeO₂ at 4 m².g⁻¹ (commercial, annealed at 600°C), (f.) (Ce_{0.75}Zr_{0.25})O₂ at 154 m².g⁻¹ (commercial).

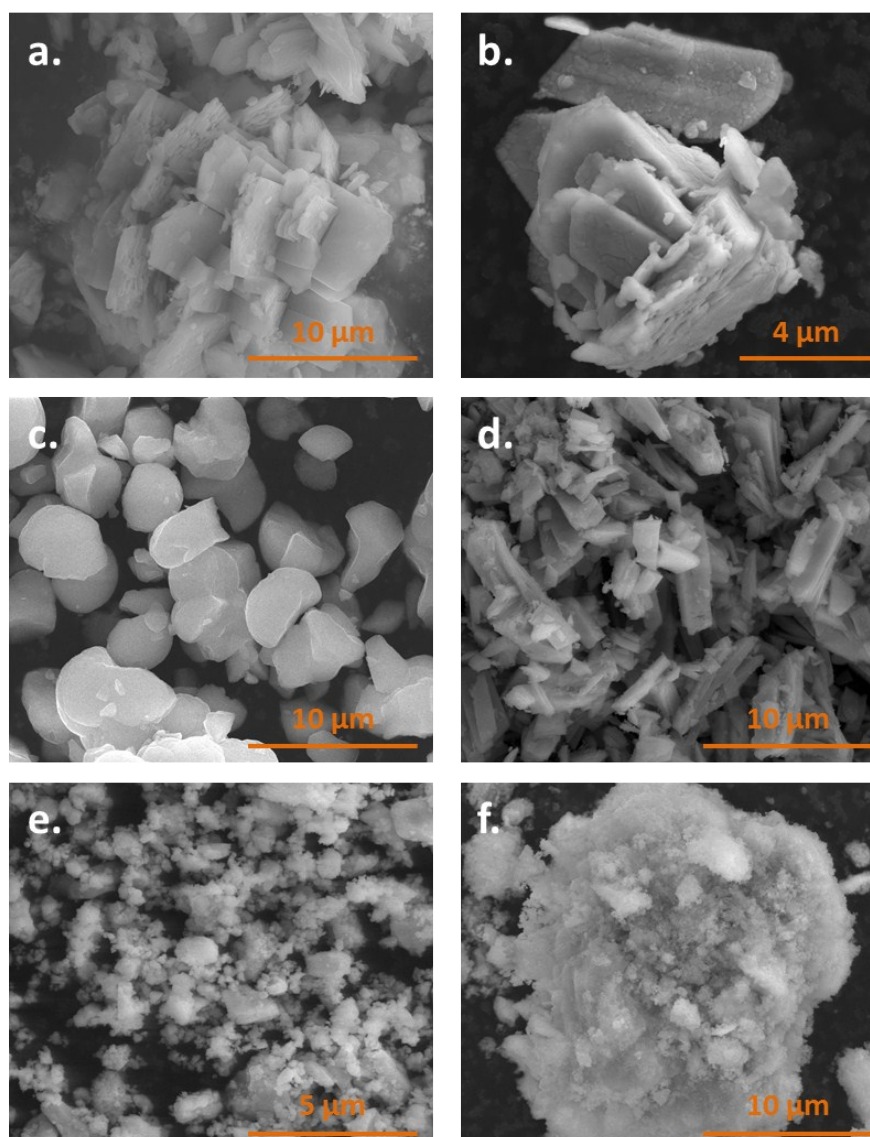


Figure S2: Dissolution kinetic curves observed for CeO_2 ($15 \text{ m}^2\cdot\text{g}^{-1}$, $\sim 180 \text{ mg}$) in 0.5 M ascorbic acid in combination with 1.5 M hydrochloric acid (stirring at $\sim 550 \text{ rpm}$, room temperature). Insert: comparison of the initial dissolution kinetics for CeO_2 ($15 \text{ m}^2\cdot\text{g}^{-1}$, $\sim 180 \text{ mg}$) in 0.5 M ascorbic acid in the presence of $0.5 \text{ M H}_2\text{SO}_4$ (green), 1.5 M HCl (blue), and 1.5 M HNO_3 (red). Initial normalized rates ($\text{g}\cdot\text{m}^{-2}\cdot\text{min}^{-1}$) are given for each curve.

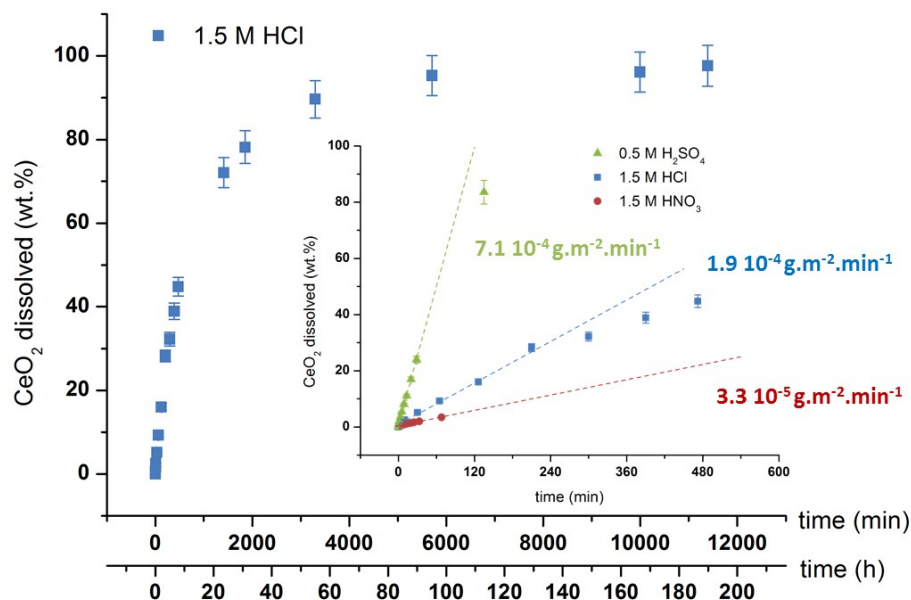


Figure S3: Molecular structures of ascorbic acid and its oxidation compounds formed during reductive dissolution.

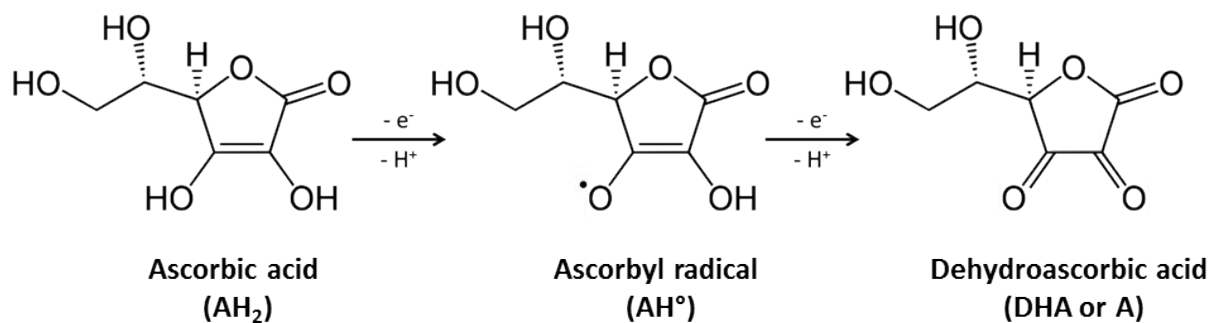


Figure S4: ATR-FTIR spectra of powders: ascorbic acid (in green), ceria ($250 \text{ m}^2\cdot\text{g}^{-1}$, in red), ceria contacted with ascorbic acid followed by centrifugation, washing and drying ($250 \text{ m}^2\cdot\text{g}^{-1}$, in blue). (a.) large spectrum; (b.) enlarged area of the spectrum.

