# Nitric Acid Radiolysis: Effect of Alpha Rays on $H_2$ and $HNO_2$ Yields.

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## Supporting Information

A validation of the analytical method was required prior to irradiations. In this sense, solutions of 2 M $HNO_3$ were irradiated at a dose rate of 0.1 Gy/s. One solution was irradiated for 7200 s, and the gas atmosphere was sampled every 1200 s. Another solution was irradiated for 14400 s, and the gaseous atmosphere sampled every 20 minutes, starting after 7200 s. The sampled volume does not induce any disturbance in the measurement, as can be seen in Figure 1S: the two set of data show good coherence, and the point at 835 J/Kg (7200 s), match within the measurement error. Therefore, this analytical method is validated, as the sampling of the gaseous atmosphere does not affect the measurements.
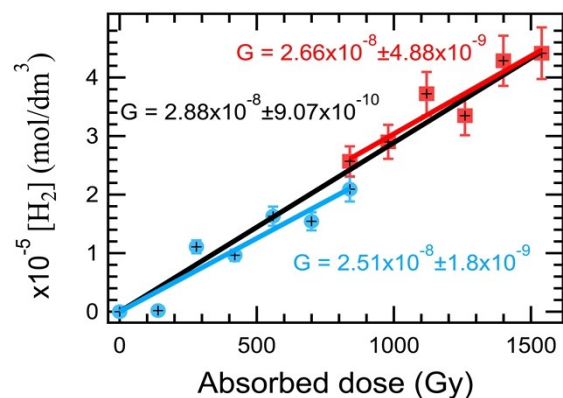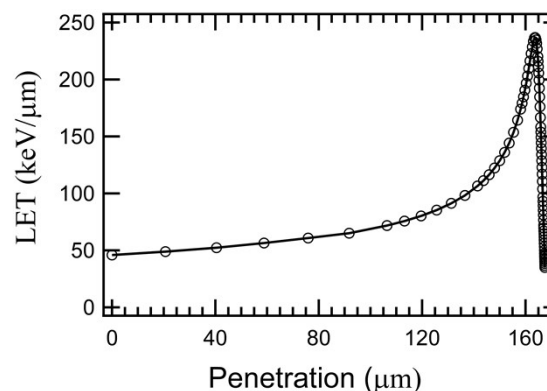


Figure 2S: The SRIM evaluated dose deposition rate vs the penetration depth of the alpha particles.

Prior to all irradiation, an *in-situ* dosimetry is performed using the super Fricke chemical dosimeter. The concentration of ferric ions is followed by monitoring the absorption at 304 nm ($\varepsilon$=2197 $M^{-1}\cdot cm^{-1}$). The evolution of the absorbed dose in time, calculated according to equation 2 is presented in Figure 2S, and from the slope of these lines we can determine the dose rate.

$$D_{Fricke} = \frac{[Fe^{3+}]}{G(Fe^{3+}) \cdot \rho} \quad (2)$$



Figure 1S: $H_2$ production in 2 M $HNO_3$ solutions irradiated at a dose rate of 0.1 Gy/s. Coherence between data sampled every 1200 s for samples irradiated 7200 s (in black) and every 1200 s for samples irradiated 14400 s, sampling starting after 7200 s (in red).
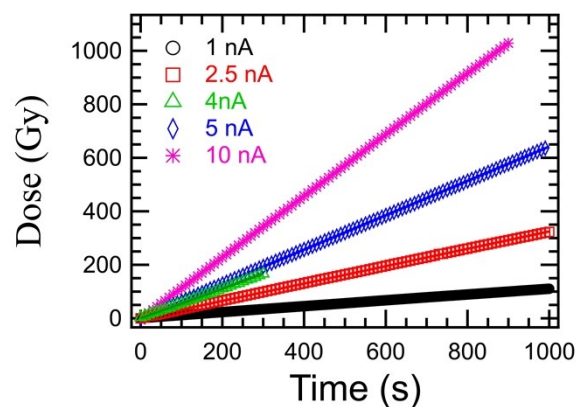


Figure 3S: Dose evolution as a function of time for the chosen current intensities.

Figure 4S shows the literature data on the variation of the dissociation degree as a function of the HNO$_3$ concentration.
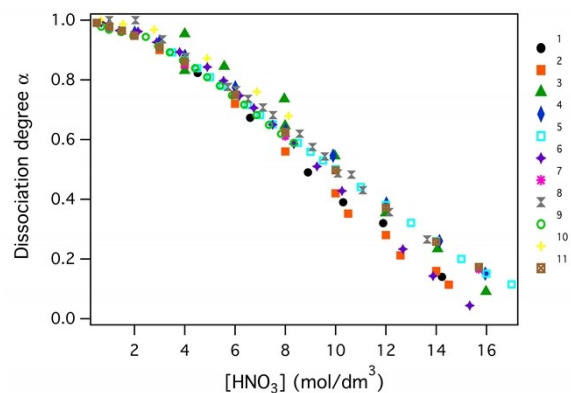


Figure 4S: Literature values for the dissociation degree of HNO$_3$ showing a decreased dissociation at higher acid concentrations.[1–11]

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