

Supporting information

Putting waste to work: the demonstrative example of pyrite quarry effluents turned into green oxidative catalysts

Camille Bihanic,[†] Andrii Stanovych,[†] Franck Pelissier[†]
and Claude Grison^{*†}

Laboratory of Bio-inspired Chemistry and Ecological Innovations, UMR 5021 CNRS – University of Montpellier – ChimEco - Cap Delta, 1682 Rue de la Valsière, 34790 Grabels, France

* Corresponding author: e-mail: claudio.grison@cnrs.fr

Totals – 6 pages, 5 figures, and 6 tables

S1. Evolution of catalysts mineral composition as a function of the pH of precipitation

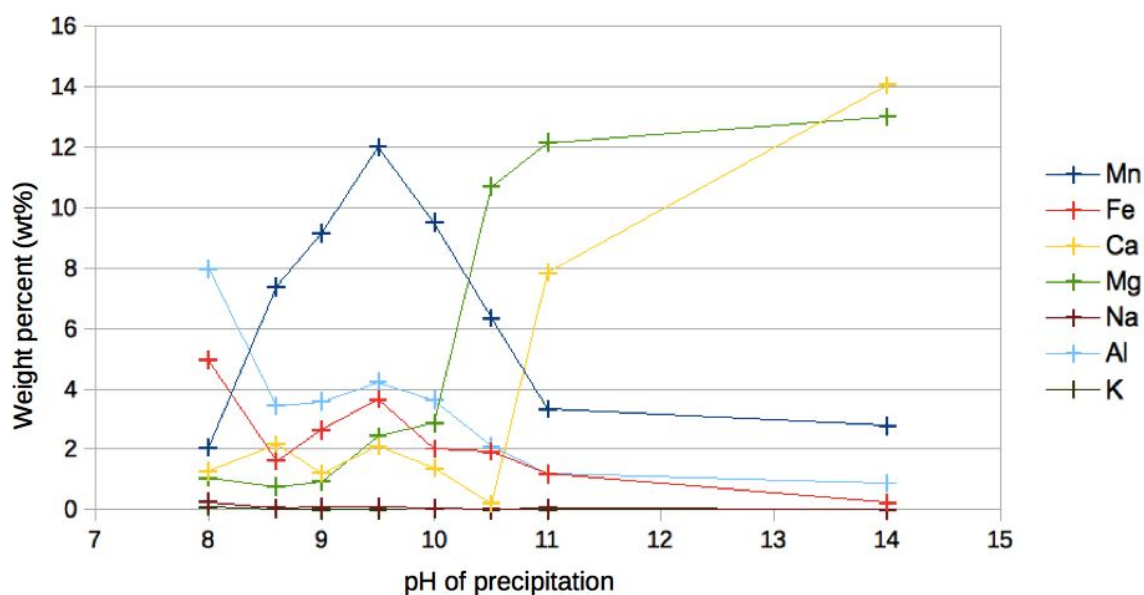


Figure S1. Evolution of catalysts mineral composition as a function of the pH of precipitation.

S2. Mn 2p XPS spectra of Pyr-Mn

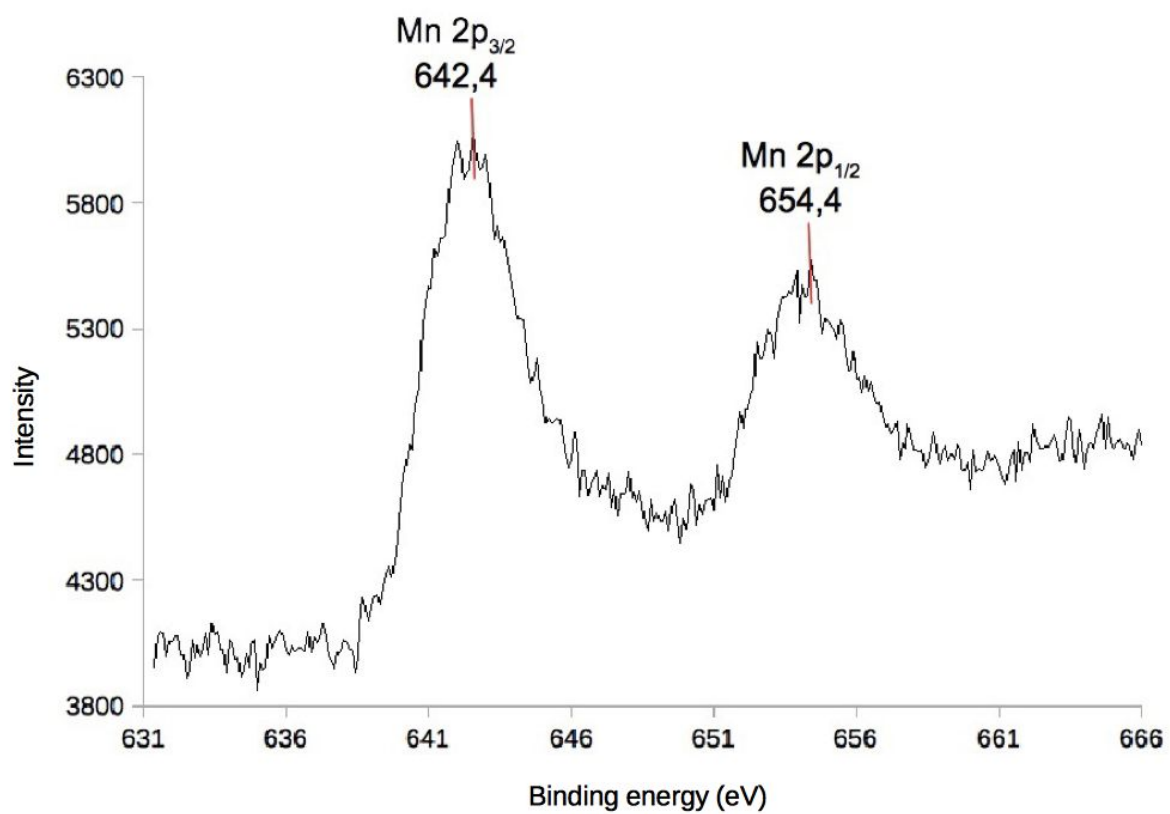


Figure S2. Mn 2p XPS spectra of Pyr-Mn.

S3. HRTEM image of commercial activated MnO₂

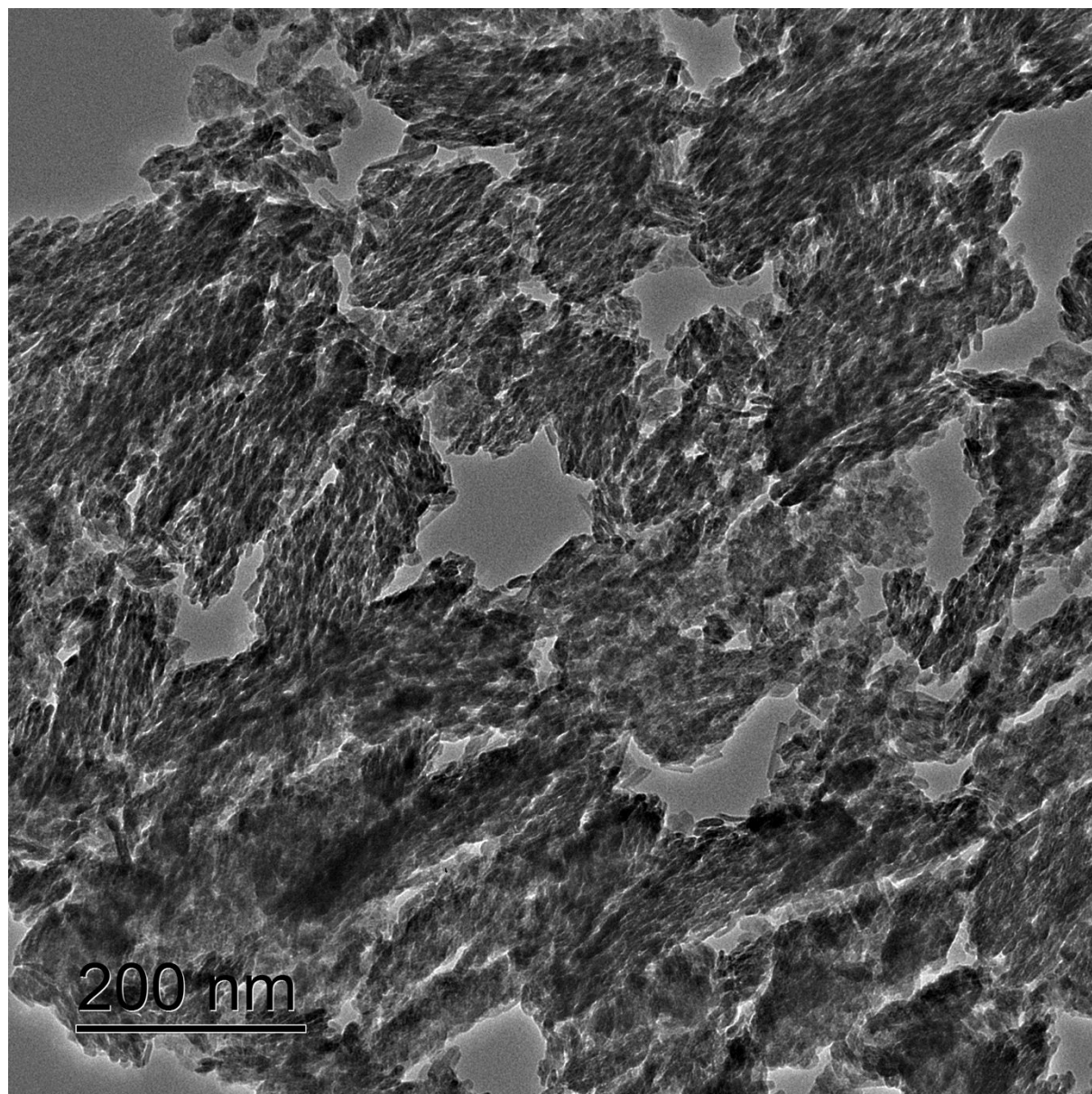


Figure S3. HRTEM image of commercial activated MnO₂.

S4. N₂ adsorption-desorption isotherm of a) Pyr-Mn₁; b) Pyr-Mn₂ and c) commercial activated MnO₂. Insets show the pore size distribution of the corresponding samples

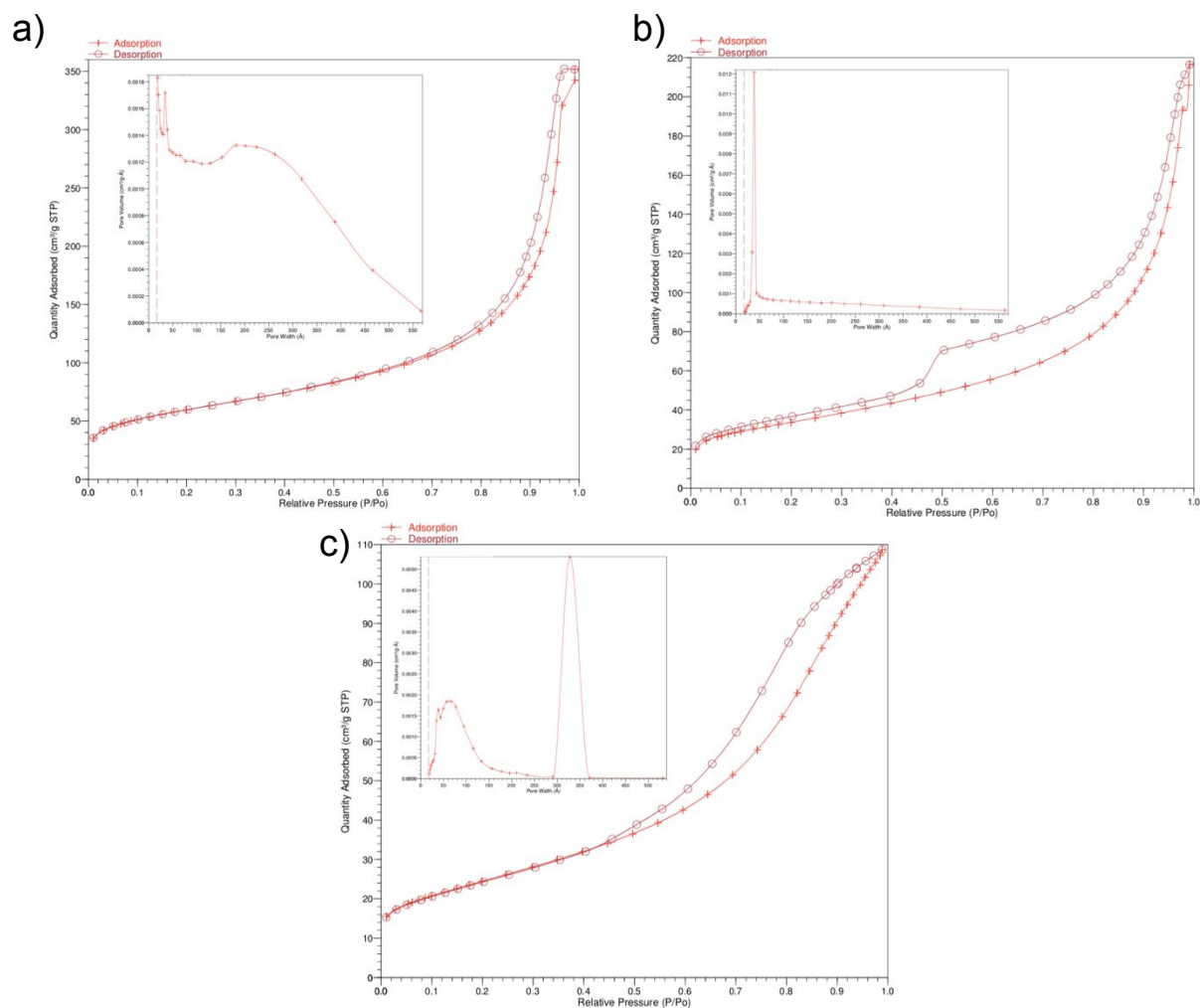


Figure S4. N₂ adsorption-desorption isotherm of a) Pyr-Mn₁; b) Pyr-Mn₂ and c) commercial activated MnO₂. Insets show the pore size distribution of the corresponding samples.

S5. STEM-EDX mapping of Pyr-Mn₁

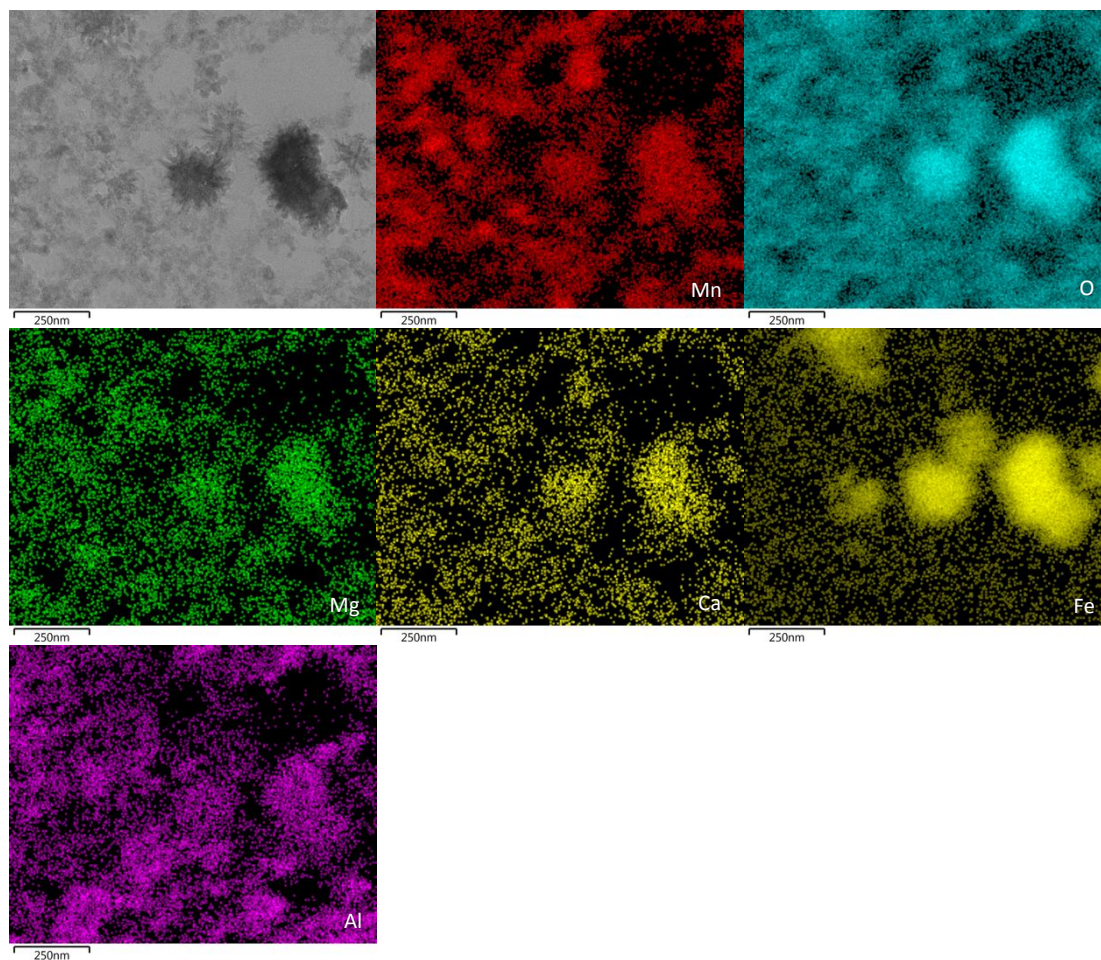


Figure S5. STEM-EDX mapping of Pyr-Mn₁.

S6. Study of the mineral composition of effluents after filtration

| pH of precipitation | Composition (ppm) | | | | | | |
|---------------------|-------------------|-------------------|----------------|-----------------|-----------------|----------------|----------------|
| | Mn | Na | K | Mg | Ca | Fe | Al |
| 9.5 | 1.2 (± 0.9) | 87.6 (± 14.7) | 6.9 (± 0.5) | 64.2 (± 5.6) | 84.8 (± 4.3) | 0.4 (± 0.2) | 0.4 (± 0.2) |
| 11 | 0 | 157.8 (± 29.7) | 6.0 (± 1.7) | 2.5 (± 1.8) | 38.9 (± 8.9) | 0.6 (± 0.1) | 0.3 (± 0.1) |
| 14 | 0 | - | 6.4 (± 0.2) | 0 | 0 | 0.1 (± 0.1) | 0.3 (± 0.1) |

Table S6. Study of the mineral composition of effluents after filtration.

The analyses have revealed a low remaining manganese concentration, below 0.1 ppm in the case of pH 11 and 14. These values are very poor and far below the European Performance Standards (around 1.8 ppm).

The high concentrations of Na (above the limit of detection for pH 14) are caused by the addition of NaOH during the synthesis process. When the precipitation was made at pH 9.5 and 11, Mg and Ca were still remaining into the filtrate but only in low concentrations. In all cases, the mineral composition of effluents after filtration was fitting with discharge in mains drainage, after pH adjustment if needed.