ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Converting the residue from an infiltration water treatment plant (Wrocław, Poland) into a hematite red pigment – Optimising the process with a Doehlert experimental matrix

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Table S1. Equations used for the calculation of the colour differences and redness indexes based on the CIELab colour space

Parameter	Equation	Reference
ΔE^*_{ab}	$\Delta E^*_{ab} = \sqrt{L^{*2} + \Delta a^{*2} + \Delta b^{*2}}$	(Broadbent, 2010)
Δh^*_{ab}	$\Delta h^*_{ab} = \sqrt{\Delta E^{*2}_{ab} - \Delta L^{*2}_{ab} - \Delta C^{*2}_{ab}}$	
ΔC^*_{ab}	$\Delta C^*_{ab} = C^*_{sample} - C^*_{standard}$	
ΔL^*_{ab}	$\Delta L^*_{ab} = L^*_{sample} - L^*_{standard}$	
RI (redness index)	$RI = \frac{a^*(a^{*2} + b^{*2})^{0.5} \times 10^{10}}{b^* L^{*6}}$	(Barron and Torrent, 1986)

The CIELab space colour parameters: hue (h), chroma (C), lightness (L), red-green parameter (a*), yellow-blue parameter (b*)
Calculated colour differences (ΔX_{ab}): differences calculated according to the above-mentioned equations for two colours (a and b) placed in the CIELab colour space.

Barron, V., Torrent, J., 1986. Use of the Kubelka—Munk theory to study the influence of iron oxides on soil colour. Eur. J. Soil Sci. 37, 499–510. https://doi.org/https://doi.org/10.1111/j.1365-2389.1986.tb00382.x

Broadbent, A.D., 2010. Colorimetry, Methods. Encycl. Spectrosc. Spectrom. Second Ed. 7, 372–379. https://doi.org/10.1016/B978-0-12-374413-5.00014-2

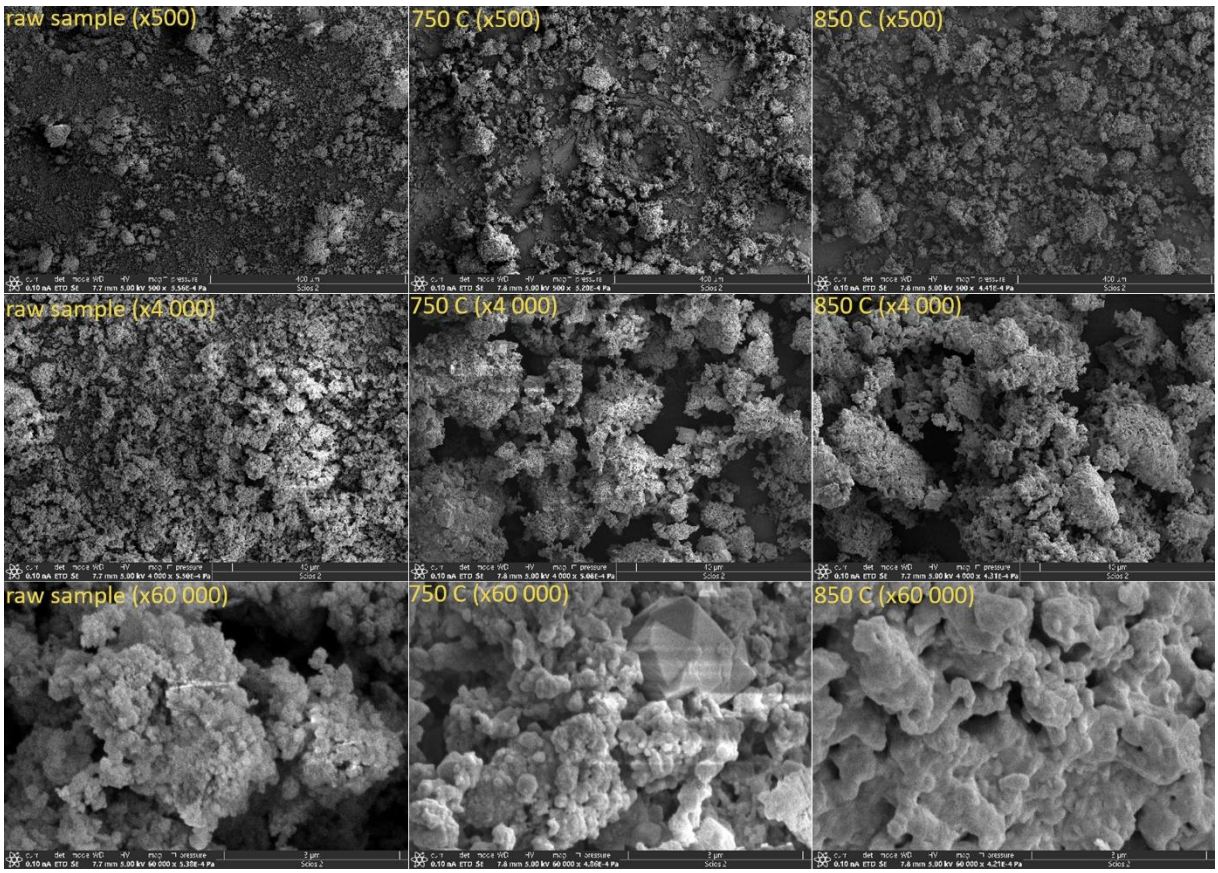

Fig. S1. SEM micrographs of the products obtained from CH-WTR at various temperatures (magnifications of x500, x4,000 and x60,000)

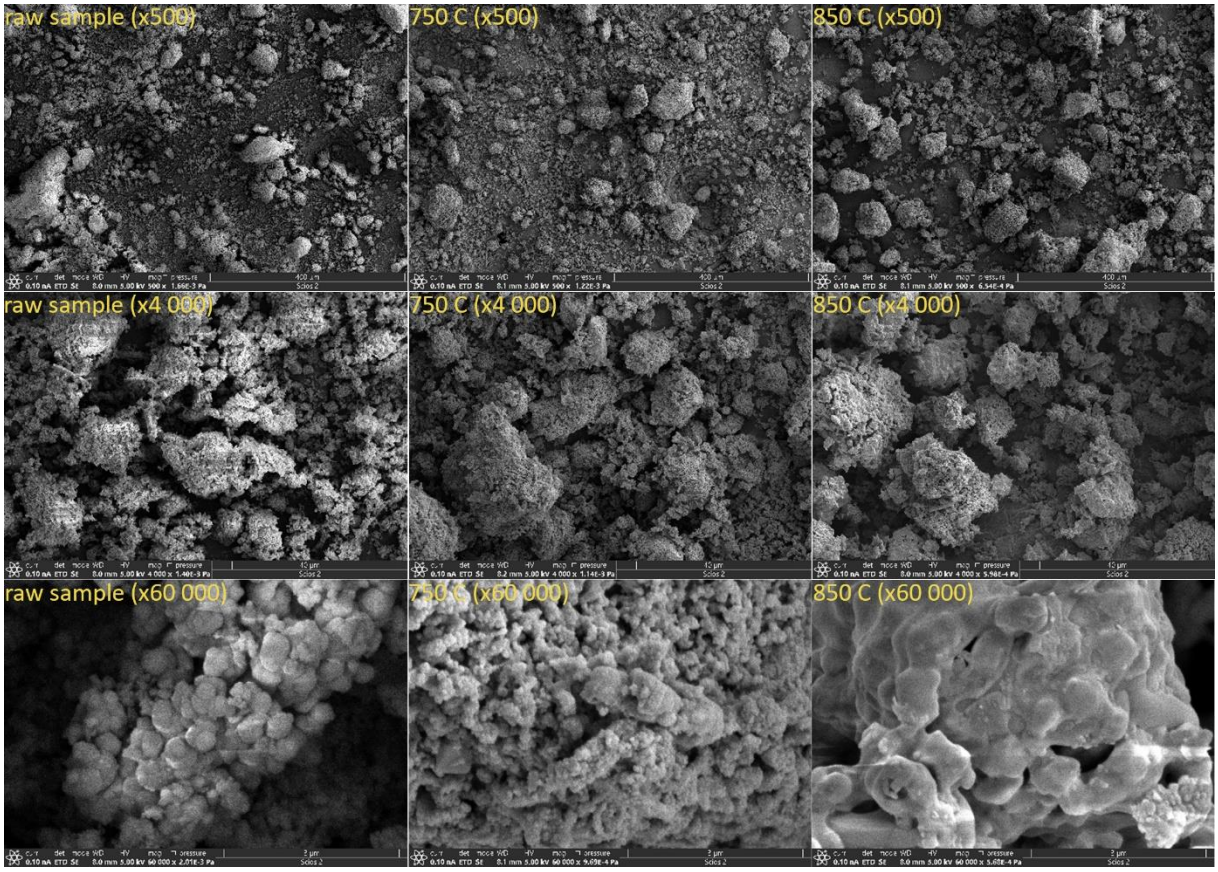

Fig. S2. SEM micrographs of the products obtained from WTR at various temperatures (magnifications of x500, x4,000 and x60,000)

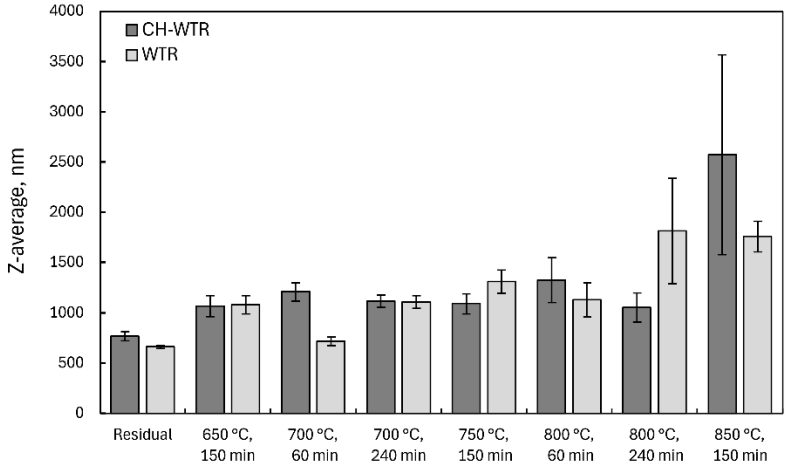

Fig. S3. Average particle size of the products obtained by conversion of CH-WTR and WTR samples under various conditions

Tab S2. Experimental and calculated values of the parameter *a* (used as the system response in a Doehlert experimental plan)

Experimental run	Y_{exp}	Y_{calc}*
1	12.160	13.622
2	16.360	14.898
3	18.410	16.948
4	16.250	17.712
5	20.010	18.548
6	17.600	19.062
7	21.580	21.137
8	21.010	21.137
9	20.820	21.137

*correlation coefficient R_2 = 0.82

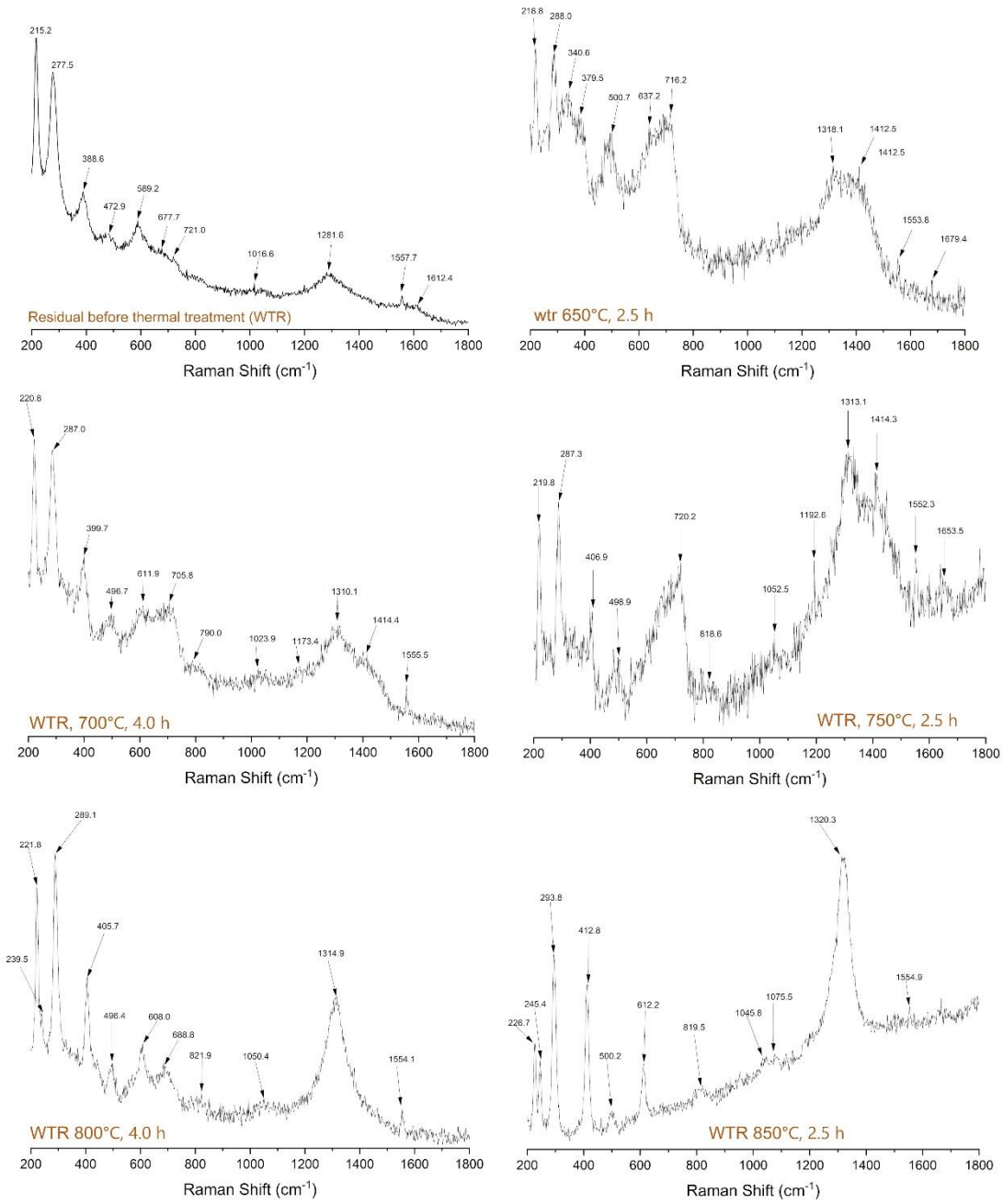

Fig. S4. Raman spectra of the products obtained by thermal conversion of the WTR sample under various conditions