Supplementary Materials: A Novel Synthetic Route to Prepare High Surface Area Mayenite Catalyst for TCE Oxidation

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S1 Mayenite Catalyst Characterization

TGA Analysis of PMMA

PMMA polymer (Esprix MX-150 series) was used as soft templating agent for mayenite synthesis. TGA analysis of pure polymer was conducted to evaluate the range of temperatures where the decomposition of the material occurred (Figure S1).

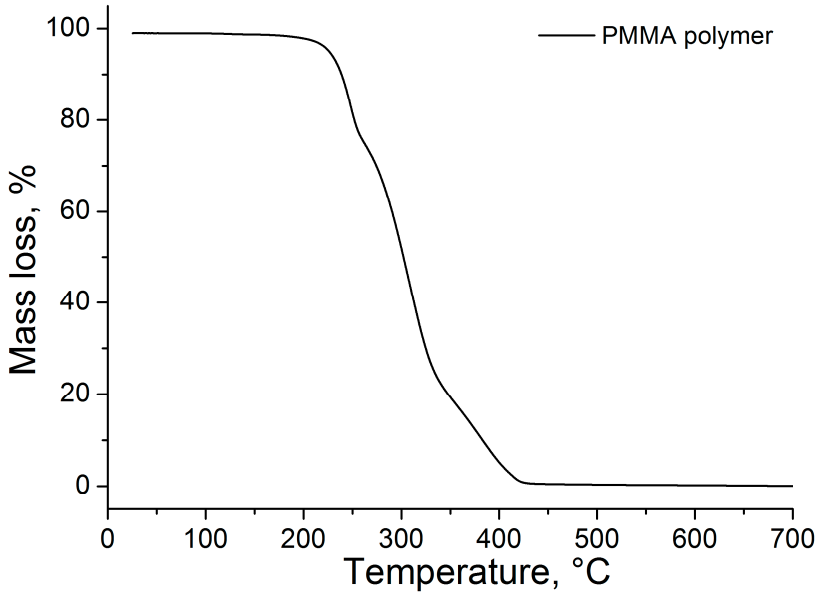

Figure S1. Thermogram of pure PMMA.

The total degradation of PMMA polymer was obtained in the temperature range of 200–450 °C. The calcination ramp used for mayenite preparation allowed to quantitatively eliminate PMMA from the reaction mixture.

TGA Analysis of Mayenite 10

The quantitative determination of $CaCO_3$ impurities in mayenite 10 sample has been determined by TGA, evaluating the weight loss in the furnace during heating. As clearly shown in Figure S2, there is a loss in the sample weight (7.1%) between 500°C and 700°C in an inert atmosphere, that can be directly correlated to the carbonate content presented in mayenite catalyst [6]. Moreover, mayenite catalyst showed a weight loss of 5% in the range of 50–250°C, corresponding to water impurities adsorbed on the catalyst surface.

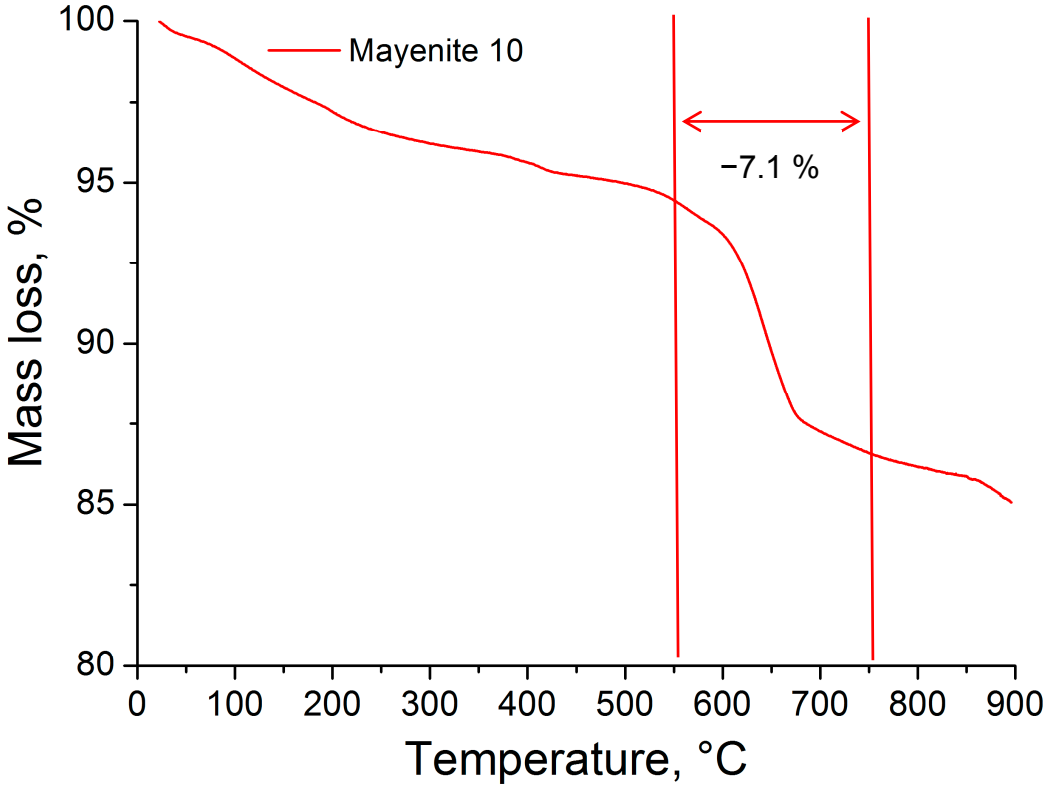

Figure S2. Thermogram of mayenite 10. $CaCO_3$ impurities decomposed (−7.1%) in T_{range} = 500–700 °C.

XRD Patterns

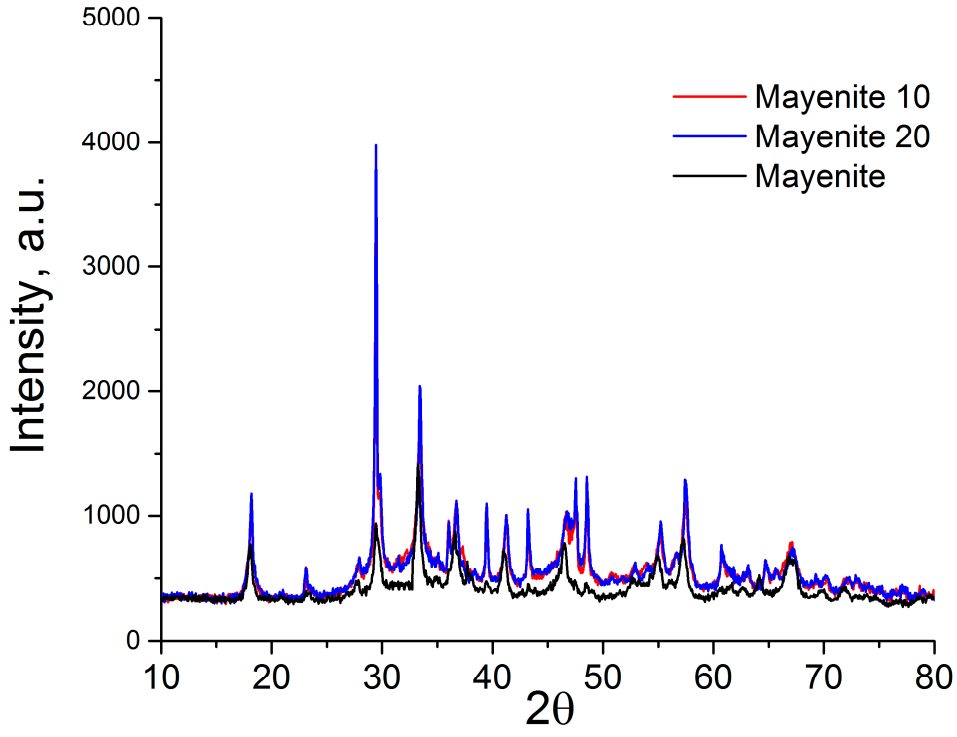

Figure S3. XRD patterns of tested catalysts.

S2 Catalytic Activity

XRD Pattern of Mayenite 10

Figure S4 shows the XRD patterns of mayenite 10 before (red line) and after (green line) stability test. At the end of the reaction the diffraction peaks attributed to calcite phase (2θ = 23.0°, 29.3°, 35.9°, 39.3°, 43.1°, 47.4° and 48.4°) almost disappeared, while signals assigned to mayenite were still present.

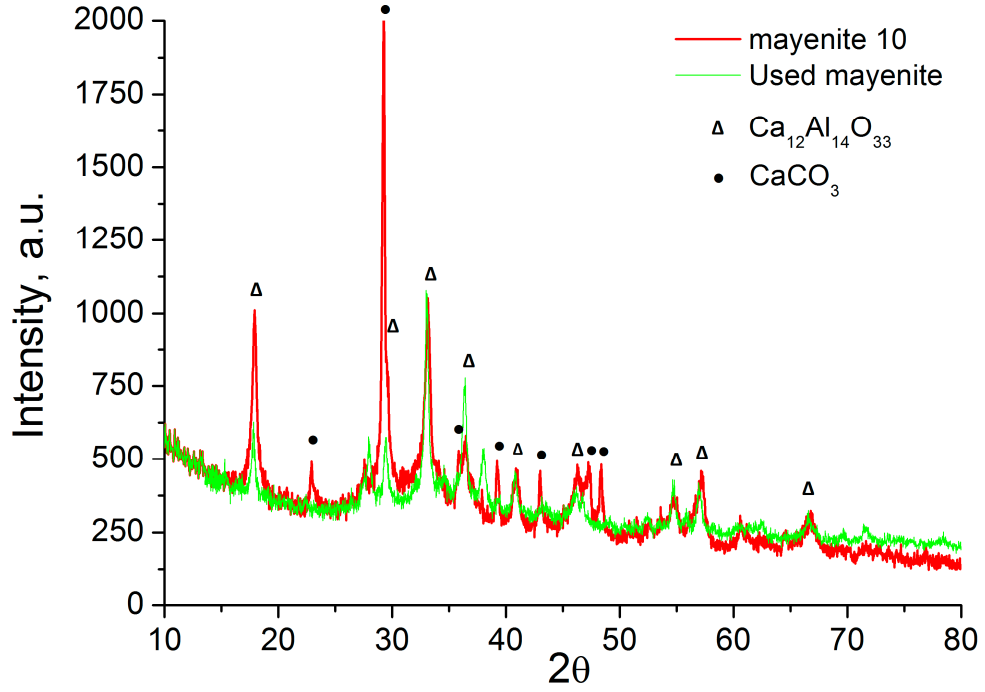

Figure S4. XRD patterns of mayenite 10 before (red line) and after (green line) stability test (catalyst = 0.7 g, [TCE] = 1000 ppm, water vapour = 1.7 %, flux = 400 mL/min, GHSV = 12000 h^{-1}, T = 500 °C).

FESEM Analysis

Figure S5 reports FESEM images of mayenite (left) and mayenite 10 (right) and shows that the microstructure of the two catalysts is different, having mayenite 10 a higher porosity compared to the pure mayenite.

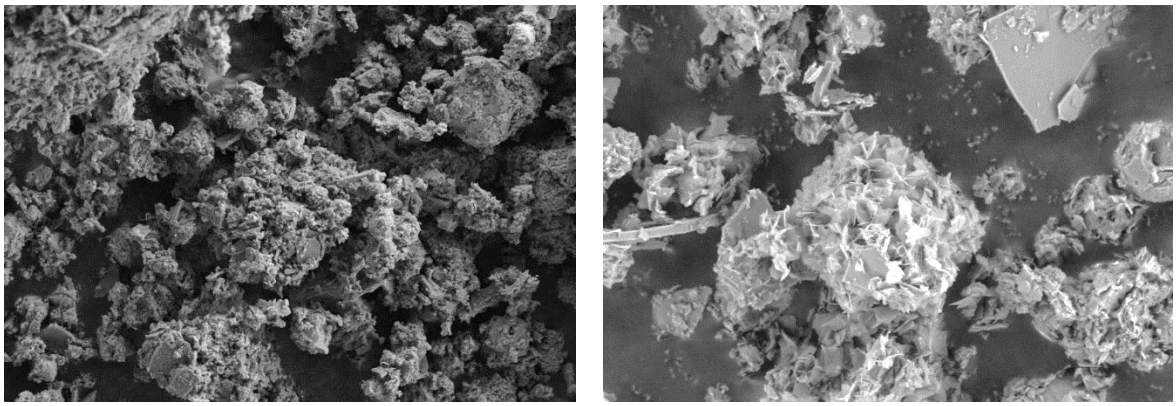

Figure S5. FESEM images of mayenite (**left**) and mayenite 10 (**right**).