

Waste PET (bottles) as Resource or Substrate for MOF Synthesis

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Supporting info:

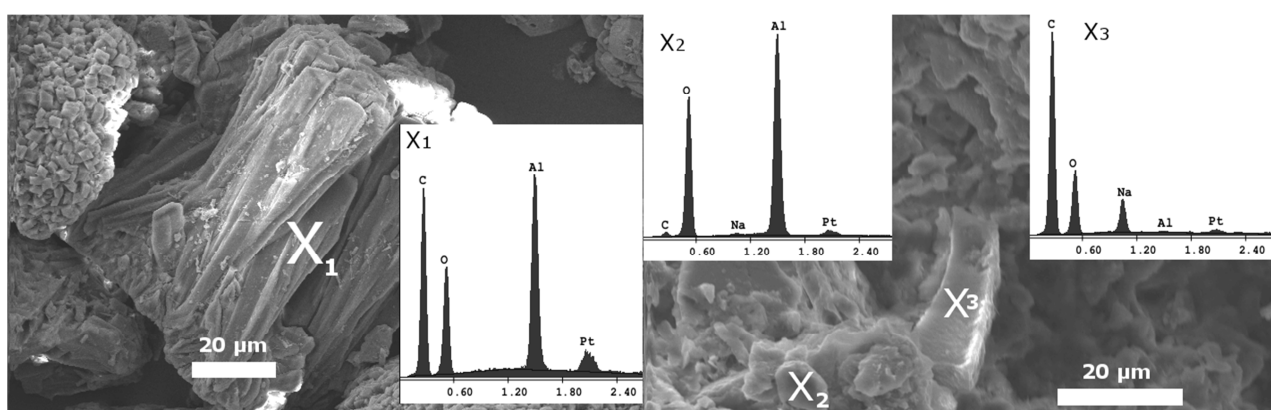


Fig. S1 EDX analysis of the material prepared according to Table 2, entry 2: MOF grown on PET (left) and the same sample after dissolving the MOFs with NaOH solution (right). X₁, X₂ and X₃ indicate the spots where the corresponding EDX analyses were performed.

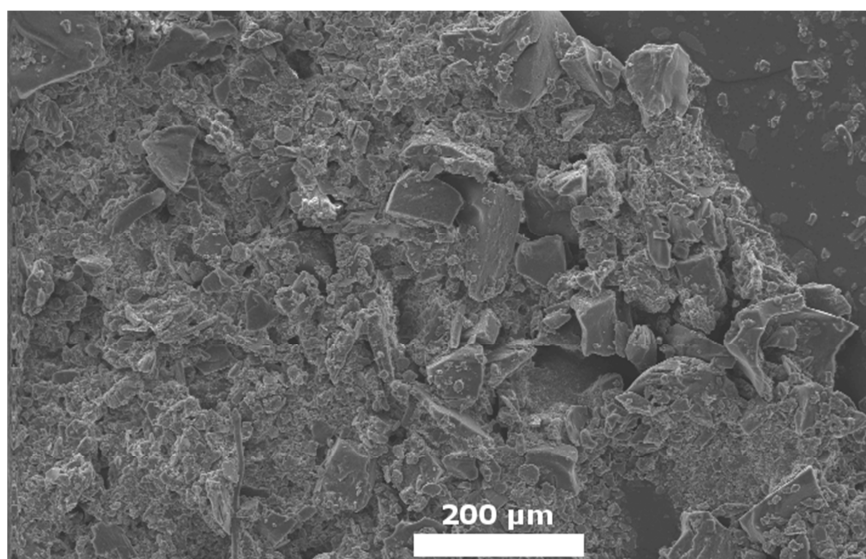


Fig. S2 SEM of MOF grown on PET (as in Table 2, entry 2) after dissolving the MOFs with NaOH .

Although the EDX of the MOF on PET is not quantitative, it shows that only carbon, aluminum and oxygen are present (Platinum is an artifact from sputtering the sample). After dissolving the MOF, two types of particles remain: irregular particles that are Al₂O₃ and smooth faced particles that consist of remaining PET. The sodium on the PET probably stems from neutralized carboxylate groups on the PET.

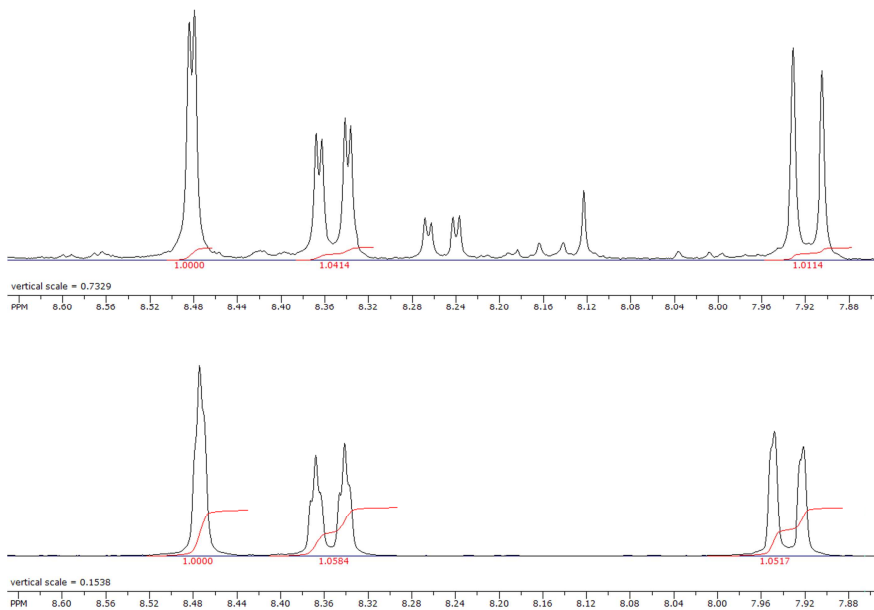


Fig. S3 (top) Hydrolysis of PET in 32 % HNO_3 results in nitration of BDC: after hydrolysis of the polymer, PET and terephthalic acid were removed by filtration; after water evaporation, the organic residu in the filtrate was redissolved in D_2O and the ^1H NMR spectrum was recorded. Signals at 8.48, 8.35 and 7.91 ppm correspond to $\text{NO}_2\text{-BDC}$ (nitroterephthalic acid). (bottom) ^1H NMR of the $\text{NO}_2\text{-BDC}$ reference compound.

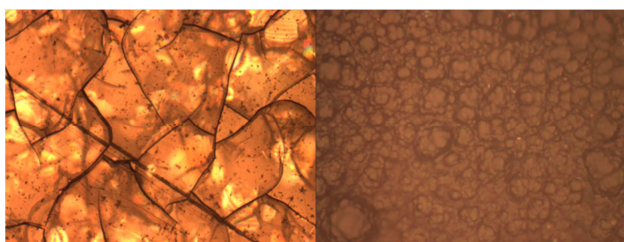


Fig. S4 Optical micrographs of the surface of hydrolyzed PET as observed with optical microscope: left, hydrolyzed with HNO_3 (10 x 10 magnification), right, hydrolyzed with NaOH (10 x 100 magnification).

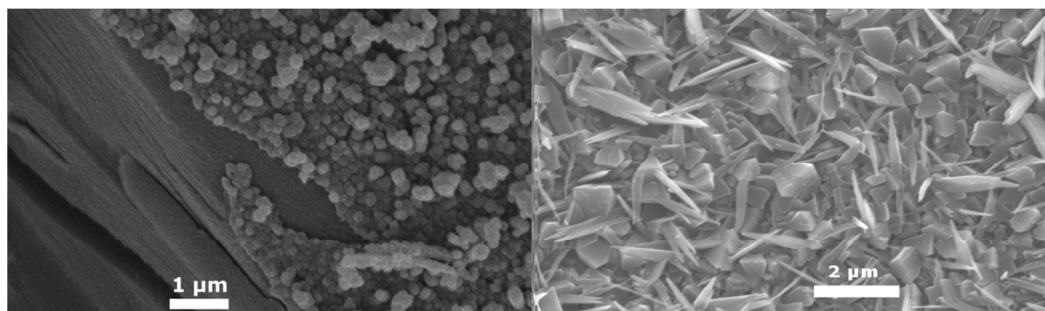


Fig. S5 SEM of MOF grown on PET chips: UiO-66 (left) and MIL-53(Al) (right).

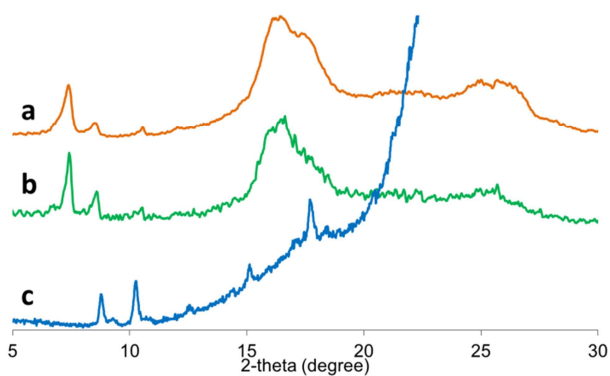


Fig. S6 XRD patterns of: (a) UiO-66, grown on a PET chip; (b) UiO-66, grown on the inside of a PET bottle; (c) MIL-53(Al) grown on a PET chip.

For XRD analysis a part of the bottle or chip was cut out for measurement. UiO-66 samples could be measured in the same time interval as used for normal MOF powder samples (20 min). For MIL-53(Al) this did not result in any reflections. When the PET chip sample of MIL-53(Al) was measured overnight with a STOE STADI MP instrument, reflections of as synthesized MIL-53(Al) became visible with a large background of crystalline PET.