Electronic Supplementary Material (ESI) for Nanoscale Horizons.

Supplementary Information

Ultrafast Assembly of Swordlike Cu_3(1,3,5-benzenetricarboxylate)$_n$ Metal–Organic Framework Crystals with Exposed Active Metal Sites

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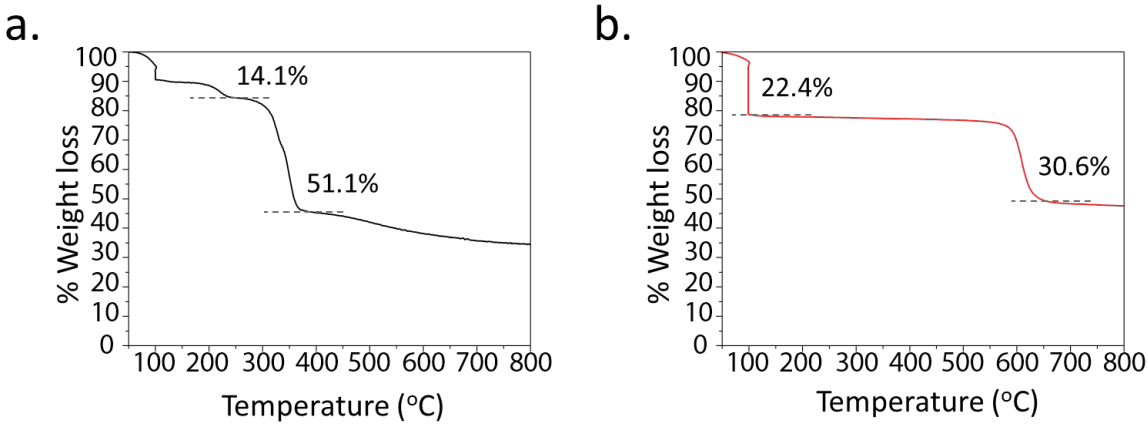
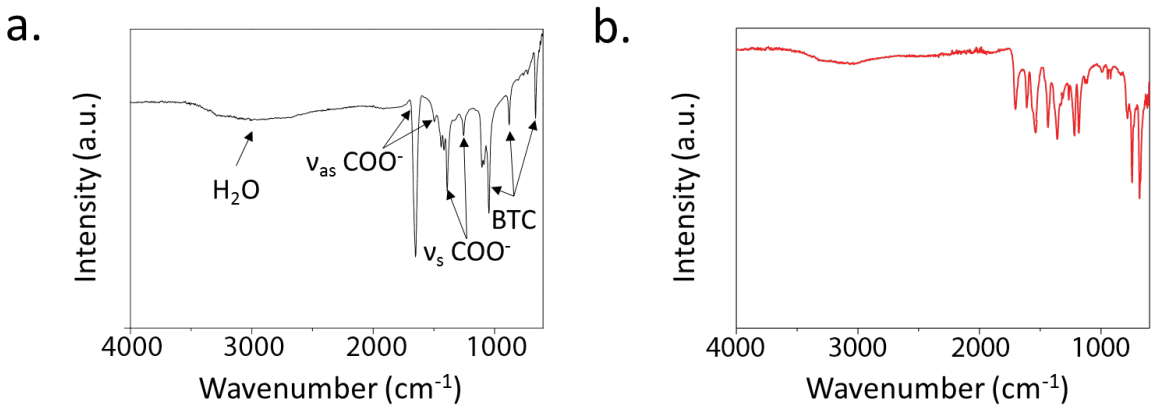
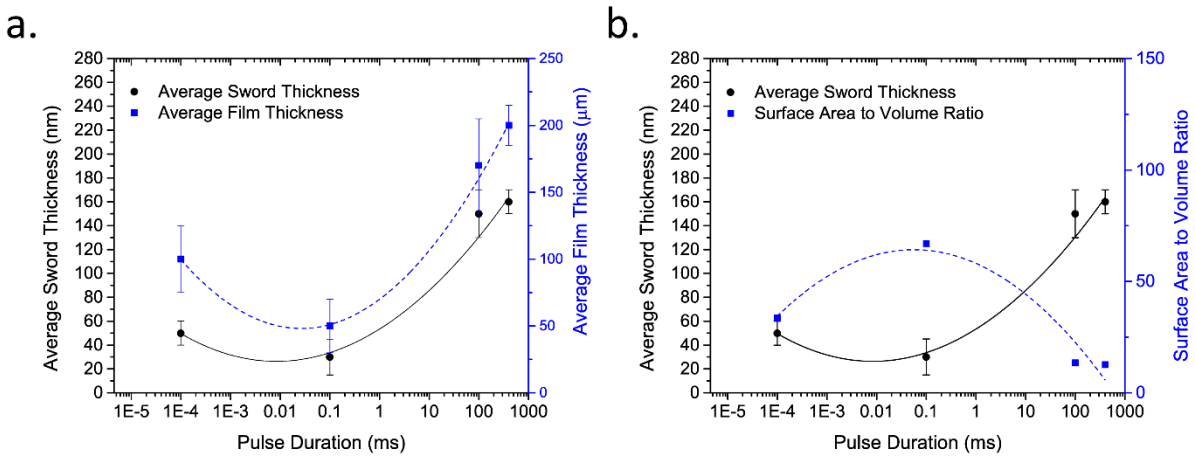


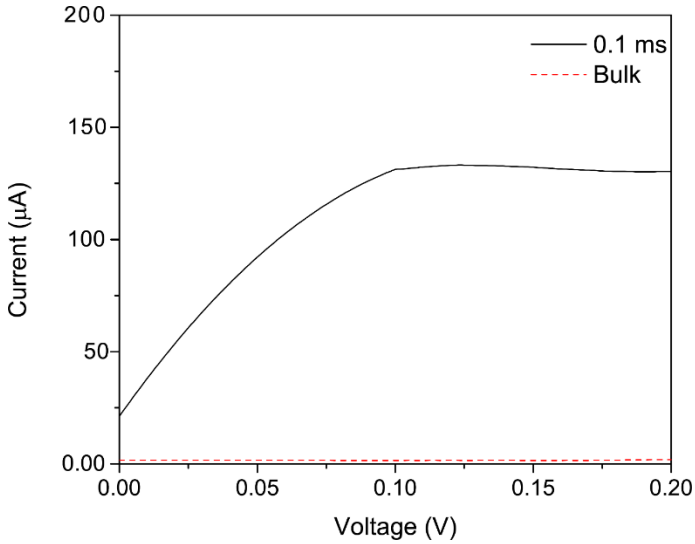
Supplementary Figure 1 Thermal gravimetric analysis (TGA) curves for (a) the swordlike Cu–BTC crystals (black) synthesized under 0.1 ms pulse durations compared to that for (b) the cubic HKUST-1 crystals (red) synthesized using the bulk solvothermal method (control).



Supplementary Figure 2 Fourier Transform Infrared (FTIR) spectra of (a) the swordlike Cu–BTC crystals (black) synthesized with the acoustic templating technique in comparison to (b) the cubic HKUST-1 (red) crystals synthesized using the bulk solvothermal method (control). ν_s and ν_{as} denote the symmetric and asymmetric stretching vibration modes of COO^-, respectively.



Supplementary Figure 3 Correlation between the average thicknesses of the swordlike Cu–BTC crystals synthesized with the acoustic templating technique (black circles) with (a) the thickness of the thin acoustowetting liquid film (blue squares), and, (b) the resultant surface area to volume ratio (blue squares) of the crystals for different pulse durations (0.1, 100 and 400 ms). We note that the case of continuous excitation is equivalent to a short pulse duration of 0.0001 ms given the 10 MHz SRBW excitation frequency. It can therefore be seen that a maximum in the surface area to volume ratio of the crystal can be found at an optimum pulse duration of 0.1 ms. Trendlines were added to aid ease of visualization.



Supplementary Figure 4 Current–voltage relationship showing the enhancement in MOF conductance, measured from the slope of the curves, of a 1 cm^2 film comprising 0.1 mg of neat (additive-free) 1D swordlike Cu–BTC crystals synthesized through the acoustic templating technique at the optimum pulse duration of 0.1 ms (black solid line) compared with that comprising 0.1 mg of neat bulk cubic (30 μm dimension) HKUST-1 crystals synthesized through the bulk solvothermal method (control; red dashed line).

Supplementary Table 1 Geometric dimensions and surface area to volume ratios of the swordlike Cu–BTC crystals synthesized via the acoustic templating method with different pulse durations and that of bulk cubic HKUST-1 crystals synthesized via the bulk solvothermal technique (control). We note that the case of continuous excitation is equivalent to a short pulse duration of 0.0001 ms given the 10 MHz SRBW excitation frequency. It can be seen that the swordlike crystals synthesized at the optimum pulse duration of 0.1 ms exhibit an increase in the surface area to volume ratio of approximately 50–70 times that of the bulk crystals.

Pulse Duration (ms)	Width (μm)	Length (μm)	Thickness (μm)	Volume (μm^3)	Surface Area (μm^2)	Surface Area to Volume Ratio
0.0001	7	70	**0.06**	29.4	989.24	**33.6**
0.1	7	70	**0.03**	14.7	984.62	**67.0**
100	7	70	**0.15**	73.5	995.4	**13.5**
400	7	70	**0.160**	78.4	991.55	**12.6**
Bulk	4	4	**4**	64	16	**0.25**