

## Water sorption studies with mesoporous multivariate monoliths based on UiO-66†

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### Abstract

Hierarchical linker thermolysis has been used to enhance the porosity of monolithic UiO-66-based metal–organic frameworks (MOFs) containing 30 wt% 2-aminoterephthalic acid (BDC-NH<sub>2</sub>) linker. In this multivariate (*i.e.* mixed-linker) MOF, the thermolabile BDC-NH<sub>2</sub> linker decomposed at ~350 °C, inducing mesopore formation. The nitrogen sorption of these monolithic MOFs was probed, and an increase in gas uptake of more than 200 cm<sup>3</sup> g<sup>-1</sup> was observed after activation by heating, together with an increase in pore volume and mean pore width, indicating the creation of mesopores. Water sorption studies were conducted on these monoliths to explore their performance in that context. Before heating, <sub>mono</sub>UiO-66-NH<sub>2</sub>-30%-B showed maximum water vapour uptake of 61.0 wt%, which exceeded that reported for either parent monolith, while the highly mesoporous monolith (<sub>mono</sub>UiO-66-NH<sub>2</sub>-30%-A) had a lower maximum water vapour uptake of 36.2 wt%. This work extends the idea of hierarchical linker thermolysis, which has been applied to powder MOFs, to monolithic MOFs for the first time and supports the theory that it can enhance pore sizes in these materials. It also demonstrates the importance of hydrophilic functional groups (in this case, NH<sub>2</sub>) for improving water uptake in materials.