

# High-throughput and *in situ* crystallization studies of metal phosphonates – building blocks and their assembly to porous compounds

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Coordination Polymers (CPs) and Metal Organic Frameworks (MOFs) are two classes of compounds that have been intensively studied throughout the last decades. Their crystal structures result from an assembly of inorganic building units and organic, polytopic linker molecules. In contrast to the well-developed chemistry of porous metal carboxylates and azolates, the number of porous metal phosphonates is limited to a few dozens of compounds. This is due to the larger coordination flexibility of the phosphonate groups and the possibility to form  $-\text{PO}_3\text{H}^-$  and  $-\text{PO}_3^{2-}$  groups, which in turn leads to more dense – often layered – structures and makes the formation of suitable and easily available inorganic building units (IBUs) as known in carboxylate-based MOFs, much harder.

The synthesis of metal phosphonates is usually carried out in solution at elevated temperatures and small changes of reaction parameters often results in the formation of new compounds. High-throughput (HT) methods are an ideal tool to systematically study such complex reaction systems and to establish important reactions trends.<sup>[1]</sup> The formation of these compounds can also be studied by *in situ* methods, which allows one to elucidate reaction kinetics and crystallisation processes.<sup>[2]</sup> Importantly crystalline intermediate phases can be detected through these kind of studies.

In the contribution recent developments in reactor designs will be covered and examples of high-throughput and *in situ* crystallisation studies as well as recent results on the synthesis of porous metal phosphonates using large rigid tri- and tetraphosphonic acids will be presented.<sup>[3]</sup>

## References:

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