

Abstract

This thesis is primarily concerned with the preparation and characterization of coordination polymers and metal-organic frameworks (MOFs) based on fluorinated tritopic carboxylic linker molecules. Altogether 47 novel coordination polymers were obtained, 32 of them were characterized by a single-crystal structure determination. 15 of the obtained coordination polymers are classified as MOFs.

The main focus was on the synthesis and characterization of new fluorinated trimesates (benzene-1,3,5-tricarboxylates, BTC³⁻). For the first time the synthesis of a difluorinated trimesic acid derivative was accomplished. Thus, the in MOF chemistry meaningful trimesate anion is now available in all degrees of fluorination.

By the reaction of the monofluorinated trimesate linker [K(H₂mFBTC)] with Lanthanide(III)-nitrates, 14 new coordination polymers of the general composition [Ln(mFBTC)(H₂O)_x] · y H₂O were synthesized and structurally characterized. Additionally, the thermal stability of these compounds was investigated. Depending on the cationic radii three different structure types with different water contents were observed.

Noteworthy are also those compounds which were obtained isotypic in different degrees of fluorination. These include two mono- respectively difluorinated barium trimesates which represent, together with an unfluorinated compound known in literature, the first example of isotypic trimesates in three different degrees of fluorination. Also, among others, the isotypic di- and perfluorinated MOFs ${}^3_{\infty}[\text{Cu}_3(\text{dFBTC})_2(\text{H}_2\text{O})_4]$ respectively ${}^3_{\infty}[\text{Cu}_3(\text{pFBTC})_2(\text{H}_2\text{O})_4]$ were synthesized and structurally characterized. Investigations on the thermal properties of isotypic compounds showed that with increasing degree of fluorination, a decrease in thermal stability is observed. Furthermore, the release of uncoordinated solvent molecules in highly fluorinated MOFs occurs at higher temperatures compared to MOFs with a lower degree of fluorination.

In addition, five different fluorinated biphenyl-3,4',5-tricarboxylic acids were synthesized and two fluorinated derivatives of the literature known MOF UMCM-150 were obtained by their reaction with metal salts.