Stability of Metal-Organic Frameworks in presence of water: New insights from 17O solid-state NMR

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Résumé

Metal-Organic Frameworks (MOFs) are promising porous crystalline hybrid materials for various applications (gas separation or storage, catalysis, medicine, etc). Nevertheless, a major limitation of these materials remains their weak stability at high temperature or in the presence of water[1]. The stability of these MOFs in the presence of water remains a property difficult to predict and highly depends on the atomic-level structure of these materials. In the present work, we have used 1D and 2D 17O solid-state NMR experiments to probe atomic-level interactions and exchanges of O atoms between water and MOFs. This original approach has been applied for UiO-66(Zr), a zirconium-based MOF promising for industrial applications because of its good stability[2]. These studies involved the preparation of different selectively 17O-labeled UiO-66(Zr) MOFs using either 17O-enriched water as the 17O source[3] or 17O-labeled ligands prepared by mechanochemistry[4].

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