Gas-Phase Loading of $[Zn_4O(btb)_2]$ (MOF-177) with Organometallic CVD-Precursors: Inclusion Compounds of the Type $[L_nM]_a$@MOF-177 and the Formation of Cu and Pd Nanoparticles inside MOF-177.

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The highly porous and desolvated (activated) coordination polymer $[Zn_4O(btb)_2]$ (btb = benzene-1,3,5-tribenzoate; MOF-177) was loaded with the organometallic compounds $[Cp_2Fe]$, $[Cp^*_2Zn]$, $[Cu(OCHMeCH_2NMe_2)_2]$, $[CpCuL]$ (L = PMe_3, CN^tBu) and $[CpPd(\eta^3\text{-}C_3H_5)]$ via solvent-free adsorption from the gas-phase. The inclusion compounds of the type $[L_nM]_a$@MOF-177, where $[L_nM]$ indicates the respective compound and *a* denotes the number of molecules per formula unit of the MOF-177, were characterised by elemental analysis, FT-IR, solid state NMR spectroscopy and by powder X-ray diffraction (PXRD). Remarkably high effective loadings of up to 11 molecules $[Cp_2Fe]$ and 10 molecules $[CpPd(\eta^3\text{-}C_3H_5)]$ per cavity were determined. The analytical data prove that the host lattice and the guest molecules interact only by weak van-der-Waals forces without any change of the framework or the chemical nature of the included molecules. Cu and Pd nanoparticles of about 2.6 nm in size were formed inside the cavities of MOF-177 by the thermally activated hydrogenolysis of the inclusion compounds $[CpCuCN^tBu]_2$@MOF-177 and by photolysis of $[CpPd(\eta^3\text{-}C_3H_5)]_{10}$@MOF-177 in inert atmosphere (Ar). PXRD, FTIR and NMR studies revealed, that the MOF-177 matrix remained unchanged. N_2 adsorption studies of the obtained materials Cu@MOF-177 (*e.g.*: 10.6 wt.% Cu, 2309 $m^2 \cdot g^{-1}$) and Pd@MOF-177 (*e.g.*: 32.5 wt.%, 1063 $m^2 \cdot g^{-1}$) reveal high remaining specific surface areas (Langmuir model).