A Zr^{4+} MOF WITH DITHIOCARBAMATE FUNCTIONALITY SHOWING EXCEPTIONAL CAPABILITY FOR Pb^{2+} UPTAKE FROM AQUEOUS MEDIA

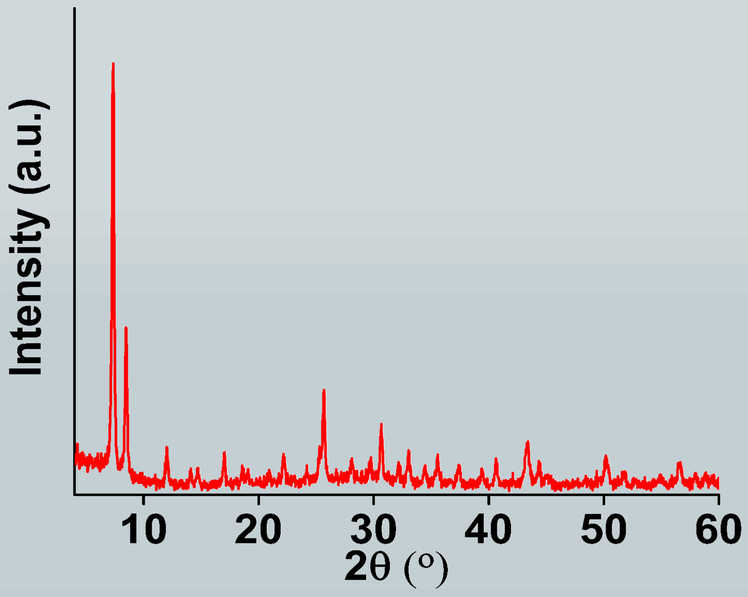
Anastasia D. Pournara[1]*, Sofia Rapti[1], Theodore Lazarides[2], Manolis J. Manos[1]

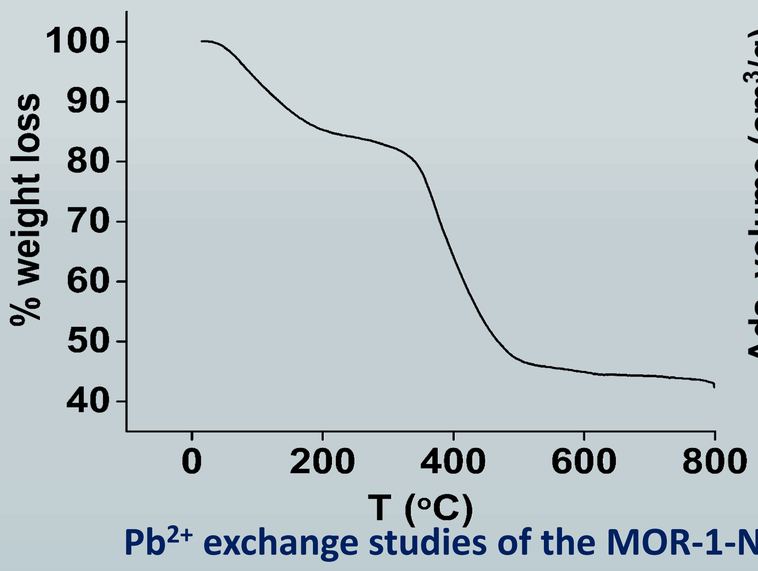
[1]*Department of Chemistry, University of Ioannina, Ioannina, 45110, Greece,* [2]*Department of Chemistry, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece*

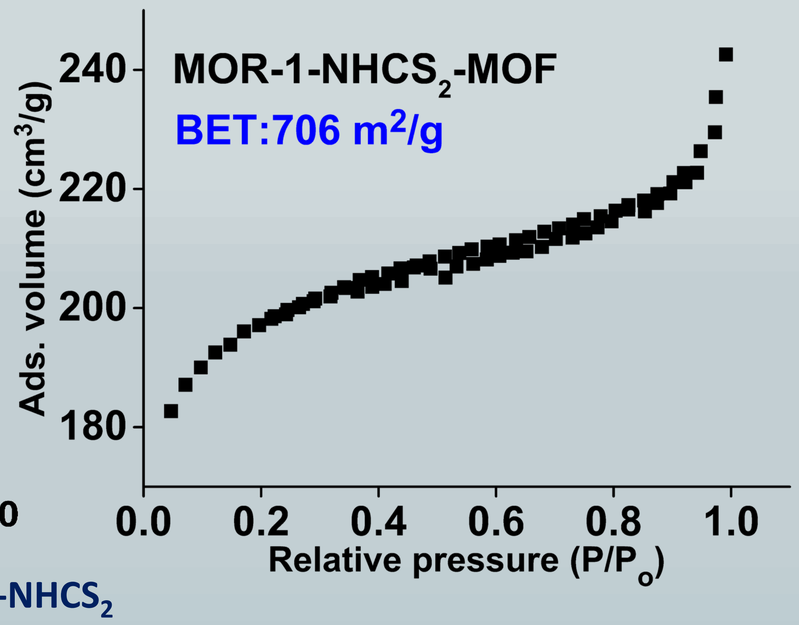
**Correspondence to: anastasiapournara@gmail.com*

Heavy metal ions represent major contaminants for the water resources, and, especially, the pollution from Pb^{2+} is a major concern, given that Pb^{2+} can cause acute and chronic poisoning effects and targets the majority of the organs in the human body.[1] For these reasons, the elimination of lead from water systems is considered highly important in current environmental research. Recently, we reported the material $[Zr_6O_4(OH)_4(NH_3^+\text{-BDC})_6]Cl_6$ (MOR-1), a MOF which showed exceptional capability to selectively absorb hexavalent chromium and other anionic species.[2] Herein, we present a post-synthetic modification of MOR-1 with CS_2, aiming in a sorbent (MOR-1-$NHCS_2$) with high efficiency to remove heavy metal ions from aqueous media.

Characterization of MOR-1-$NHCS_2$



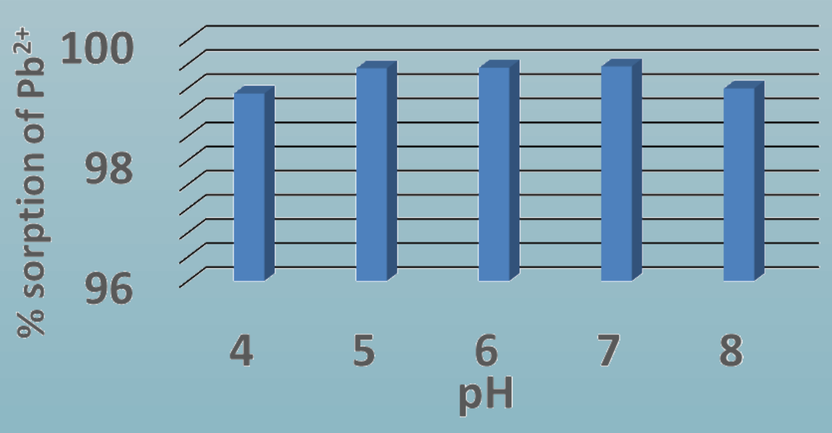


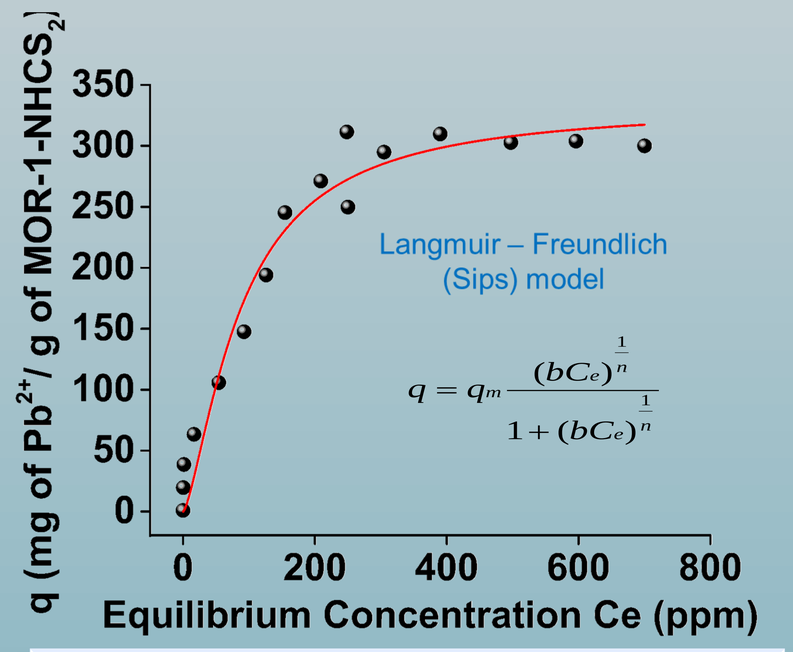


Pb^{2+} exchange studies of the MOR-1-$NHCS_2$

Kinetic Study

The kinetic investigations indicated that the capture of Pb^{2+} by MOR-1-$NHCS_2$ was remarkably fast. Interestingly, 95.6% of the initial Pb^{2+} content (c_i=1ppm) was removed within only 1 min of MOR-1-$NHCS_2$/solution contact.



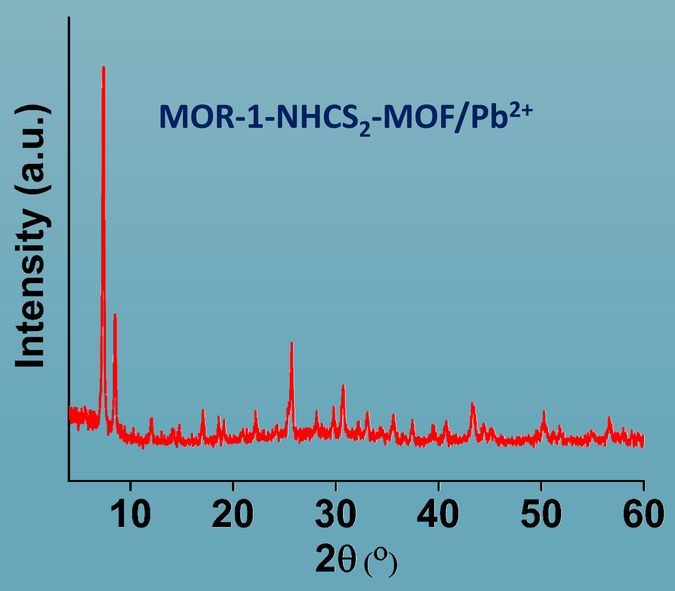


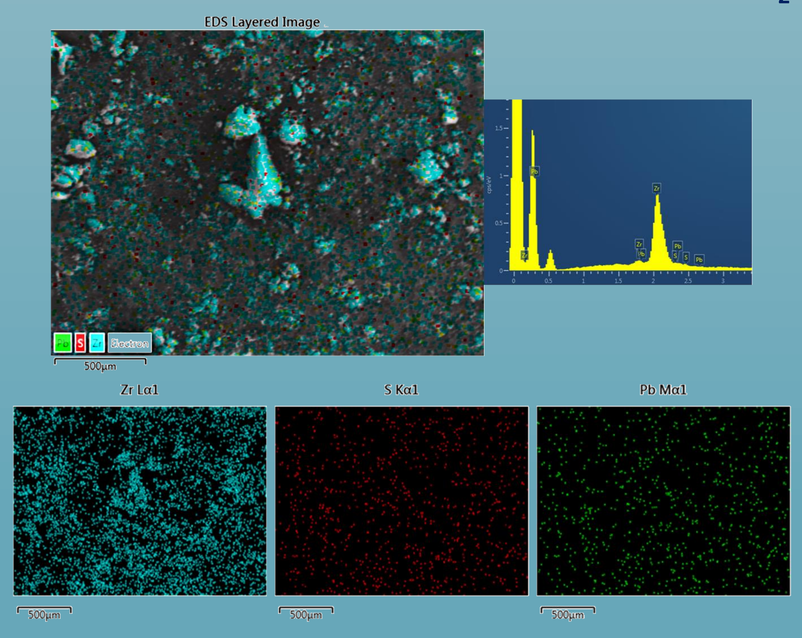
q_m= 334±25. mg/b= g, 0.011±0.0017 L/mg, n= 0.70±0.15, R^2=0.97

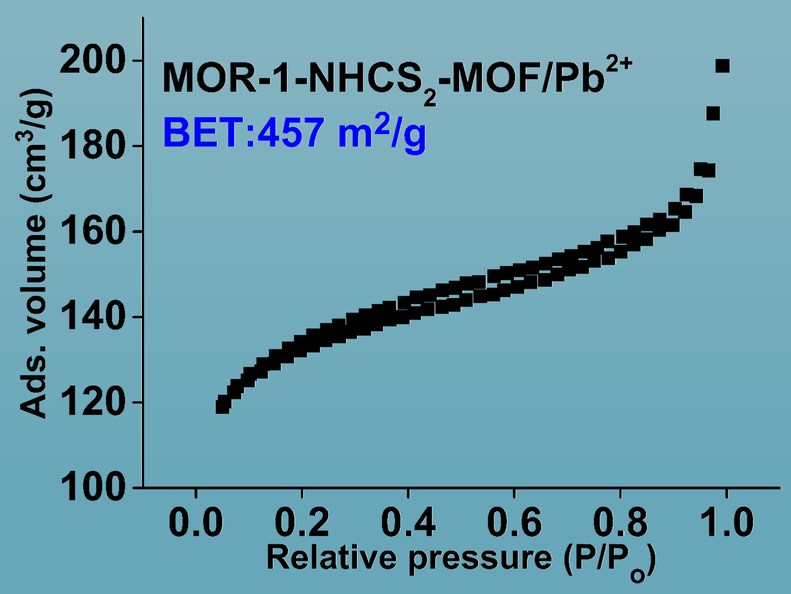
Selectivity Study

In order to investigate whether MOR-1-$NHCS_2$-MOF is suitable for Pb^{2+} sorption in genuine water samples, we performed tests with three bottled water solutions intentionally contaminated with traces of Pb^{2+} (initial total Pb^{2+} concentration = 1 ppm). Even in the presence of high excess of several competitive cationic species, the lead removal was found high and similar (>99%) to that determined in the absence of competitive cations.

Characterization of Pb^{2+}-loaded MOR-1-$NHCS_2$







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