Zr^{4+} MOFS WITH HIGH EFFICIENCY FOR REMOVAL OF TOXIC ANION SPECIES FROM AQUEOUS MEDIA

A. D. Pournara,[1,*] D. Evangelou,[1] A. Valmas,[2] I. Margiolaki,[2] E. Andreou,[3] G. S. Armatas,[3] A. C. Tsipis,[1] J. C. Plakatouras,[1] D. L. Giokas, [1] M. J. Manos[1]

[1]*Department of Chemistry, University of Ioannina, 45110, Ioannina, Greece*

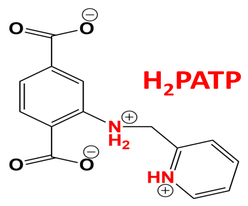
[2]*Department of Biology, Section of Genetics, Cell Biology and Development, University of Patras, 26500 , Patra, Greece*

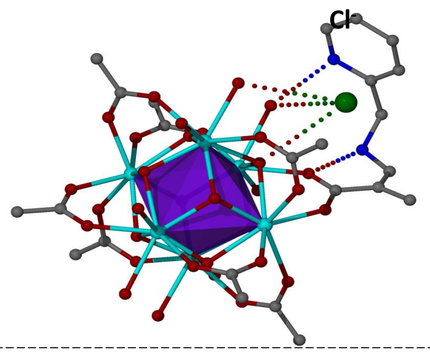
[3]*Department of Materials Science and Technology, University of Crete, 71003, Heraclion, Greece*

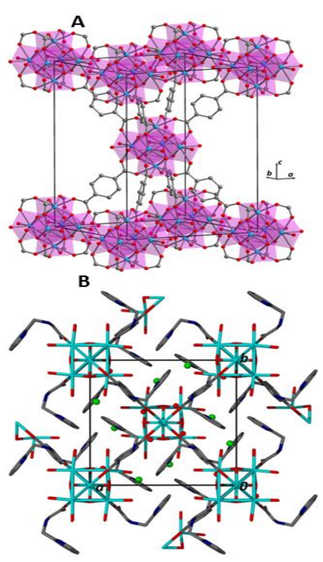
(*anastasiapournara@gmail.com*)

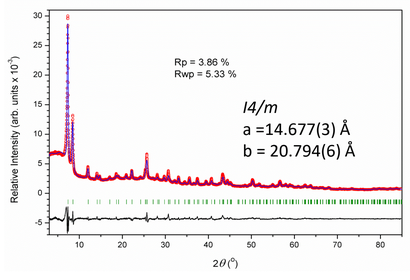
We present a new Zr^{4+} MOF, $H_{16}[Zr_6O_{16}(H_2PATP)_4]Cl_8 \cdot xH_2O$ (**MOR-2**) (H_2PATP=2-((pyridin-1-ium-2-ylmethyl)ammonio)terephthalate). This material has shown exceptional sorption capability for anionic pollutants, including carcinogenic Cr(VI) and radioactive TcO_4^-. **MOR-2** exhibits record Cr(VI) and TcO_4^- sorption capacities, as a result of its 8-connected structure favoring the strong binding of anions into the Zr_6 SBUs. Importantly, **MOR-2** in its composite forms with alginic acid (HA) was utilized in ion exchange columns, which show capability for ~ 100% removal of anionic pollutants from water (including industrial waste) and can be regenerated and reused for several cycles with almost no loss of its initial sorption capacity.

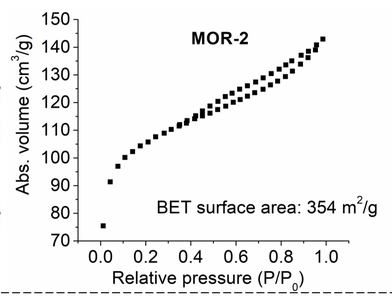
Structure-characterization



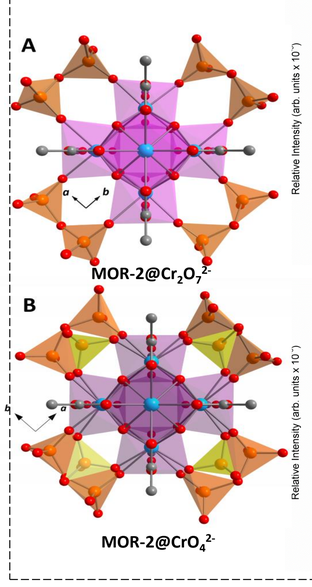


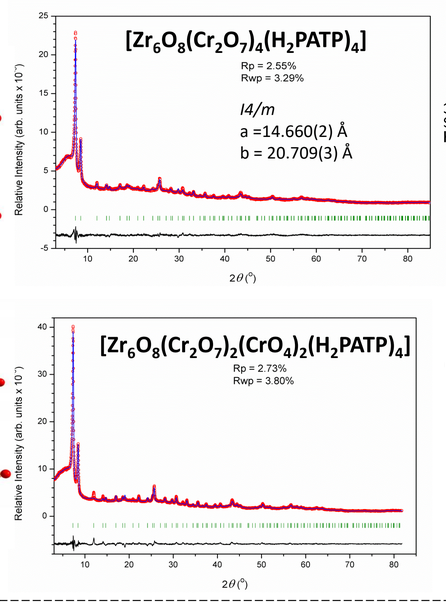


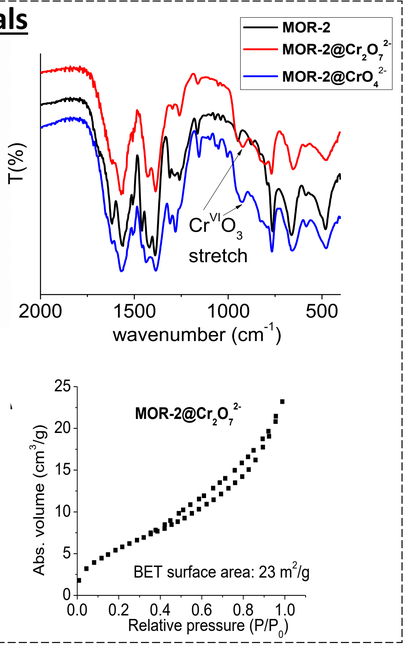




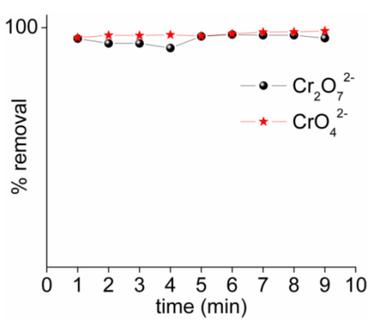
Cr(VI)-loaded materials



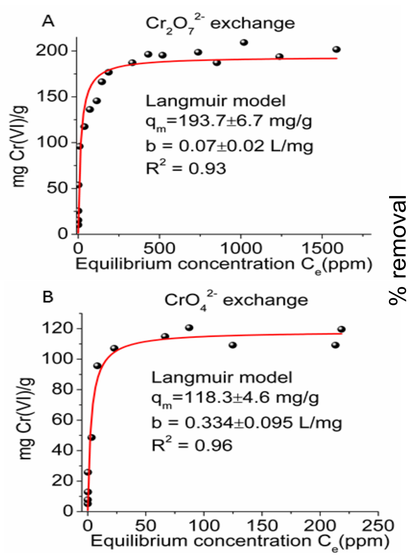


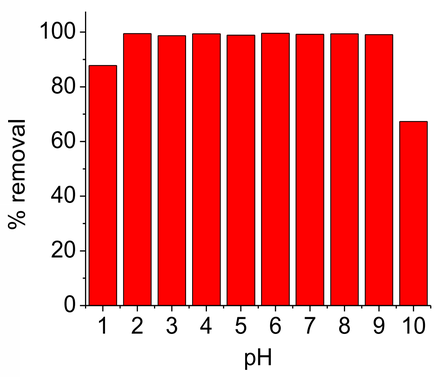


Cr(VI) sorption

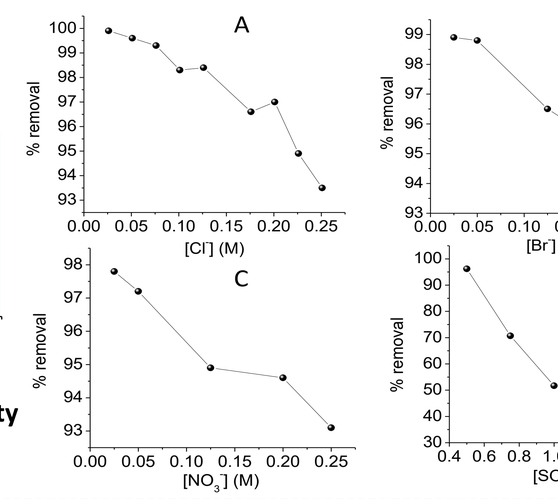


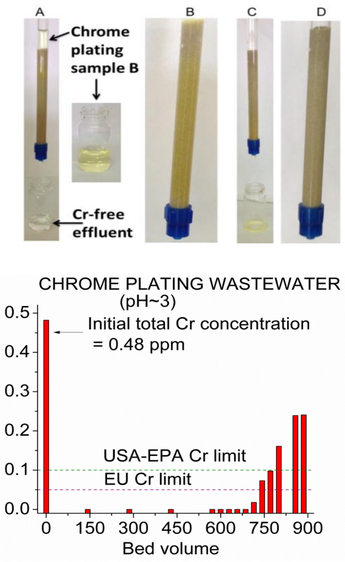
≥99.5 removal of Cr(VI) within 1 minute



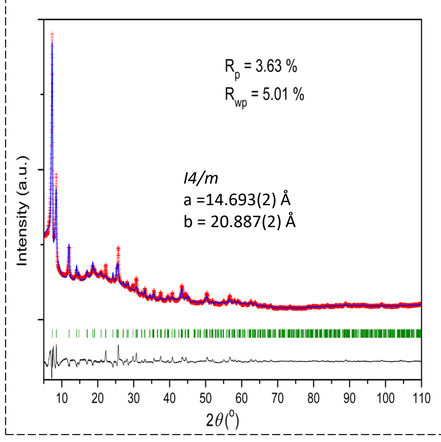


High Cr(VI) sorption capacity over a wide pH range

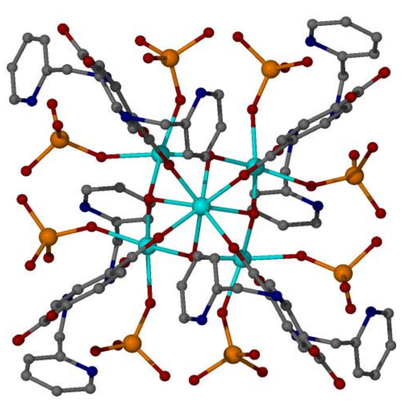


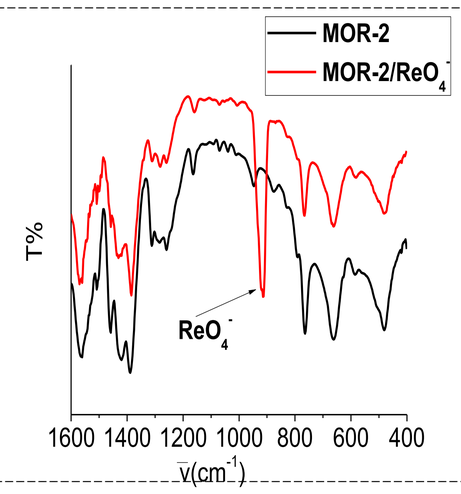


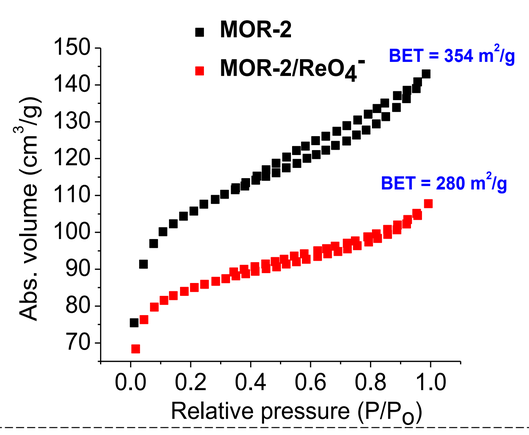
Re(VII)-loaded material



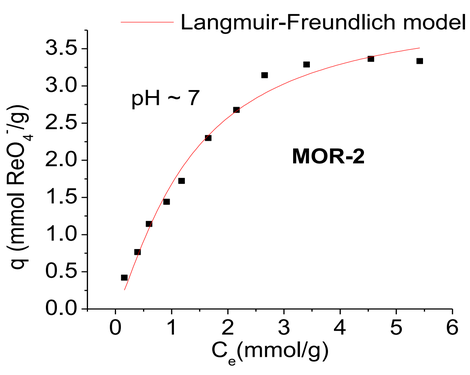
$H_{16}[Zr_6O_{16}(H_2PATP)_4]Cl_8 + 8ReO_4^- \rightarrow [Zr_6O_8(ReO_4)_8(H_2PATP)_4] + 8Cl^- + 8H_2O$



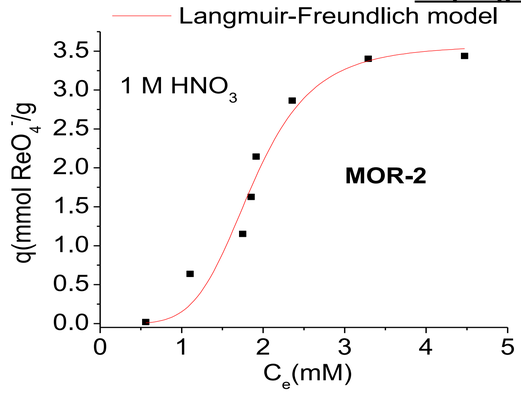




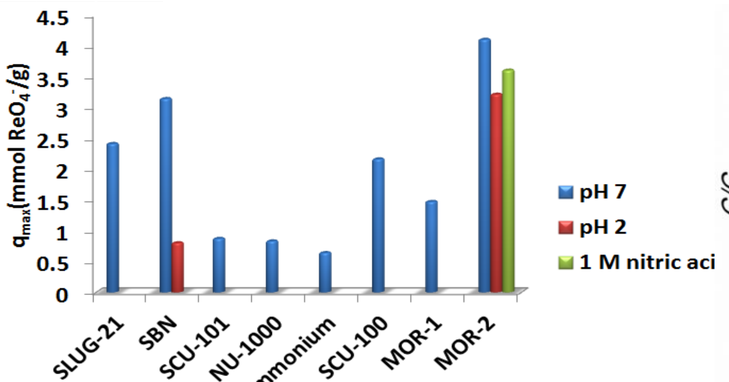
Re(VII)/Tc(VII) sorption



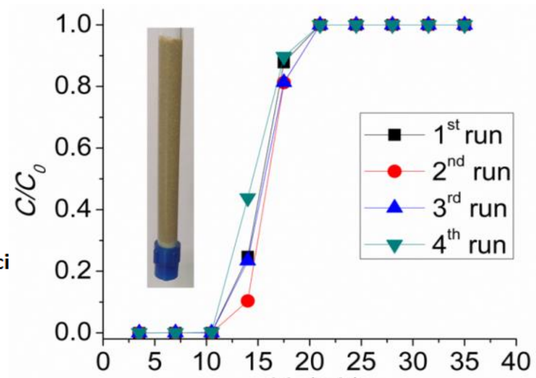
Fitting data: R^2=0.98, q_m =4.1±0.4 mmol/g, b = 0.75±0.13 L/mmol, n = 0.78±0.11



Fitting data: R^2=0.95, q_m =3.6±0.3 mmol/g, b = 0.54±0.03 L/mmol, n = 0.20±0.06



Highest Re(VII) sorption capacity among MOFs



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References

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2. S. Rapti et. al. *J. Mater. Chem. A*, **2018**, *6*, 20813.