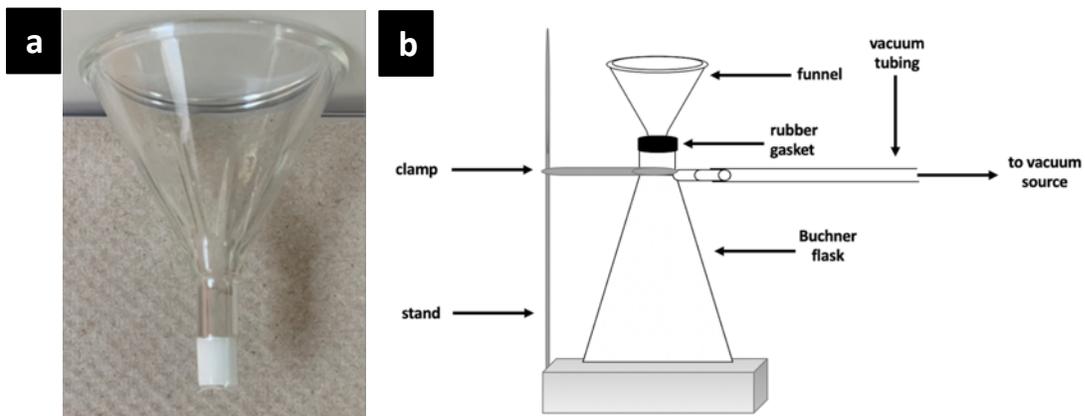


Supporting Information

**Adsorption of Crude oil from Crude Oil-Water Emulsion by Mesoporous Hafnium Oxide  
Ceramics**

Fatima A. Hussain,<sup>a</sup> Julio Zamora,<sup>b</sup> Ivonne M. Ferrer<sup>a</sup>, Maureen Kinyua<sup>c</sup> and Jesús M. Velázquez\*<sup>a</sup>



**Fig. S1** a) Funnel with MHO ceramic attached using shrinking tube, b) Experimental set up for oil sequestration experiment.

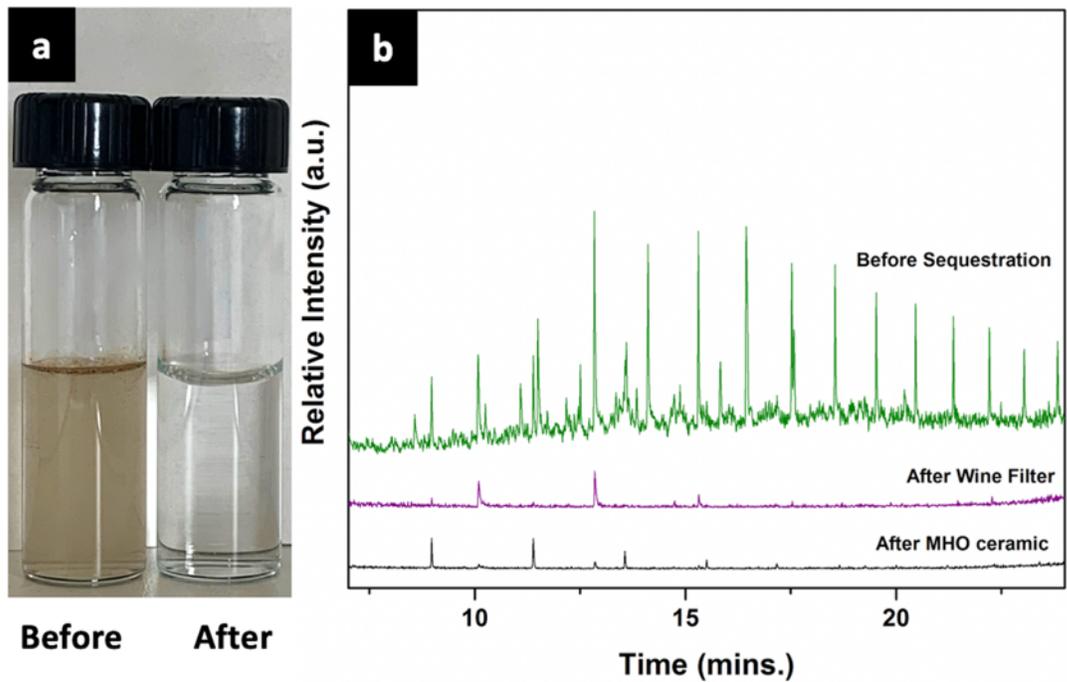


Fig. S2 a) Image of liquid in vials before and after filtration via MHO ceramic monolith in acidic pH, b) Overlaid GC-MS chromatograms of liquid-oil mixture before sequestration (green) and recovered liquid after sequestration using commercial wine filter (purple) and MHO ceramic monolith (black).

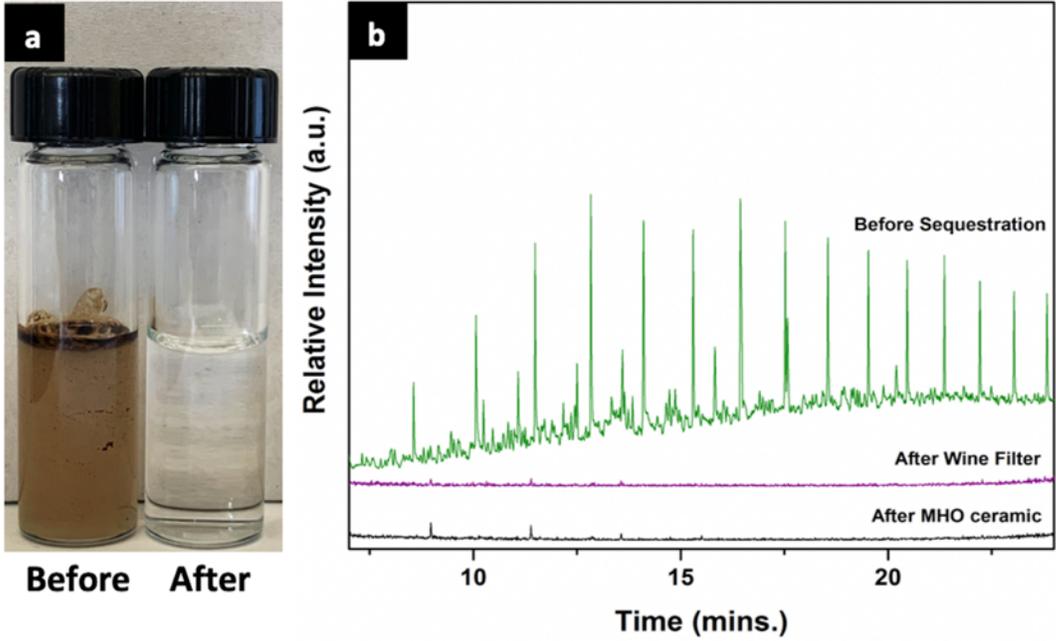
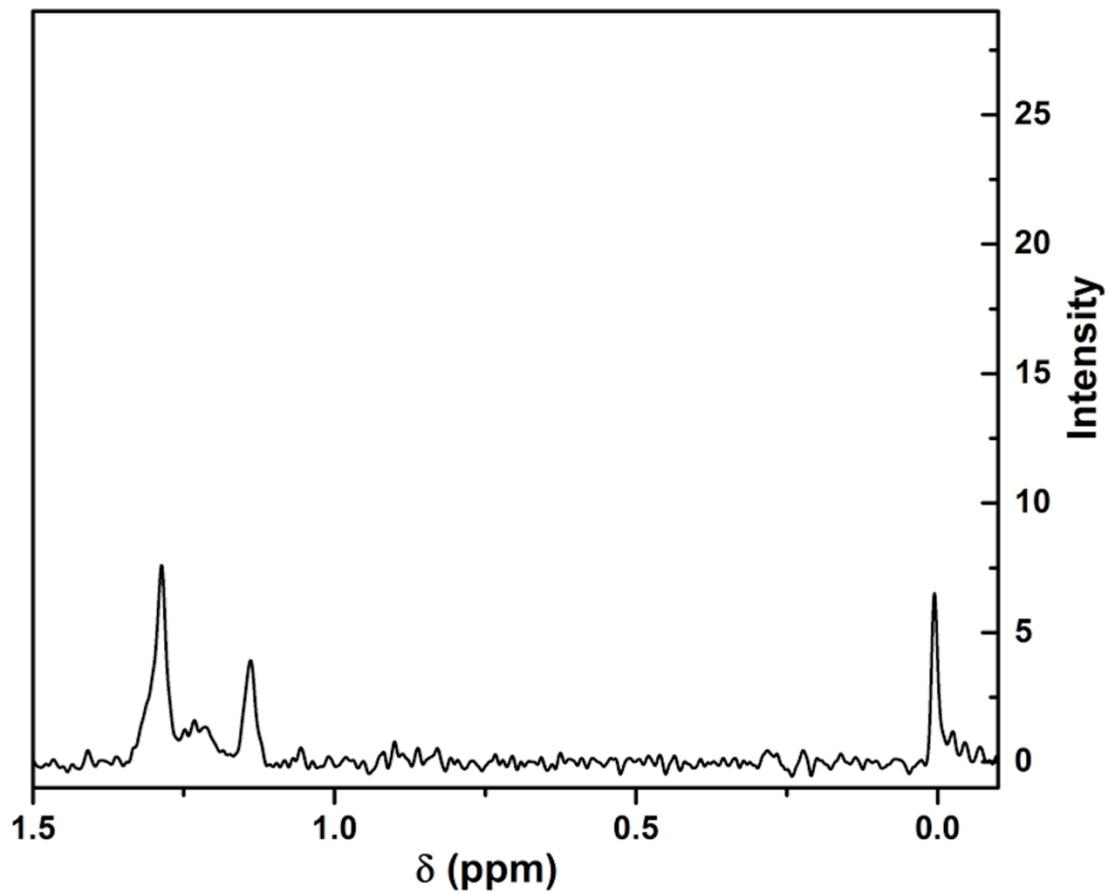
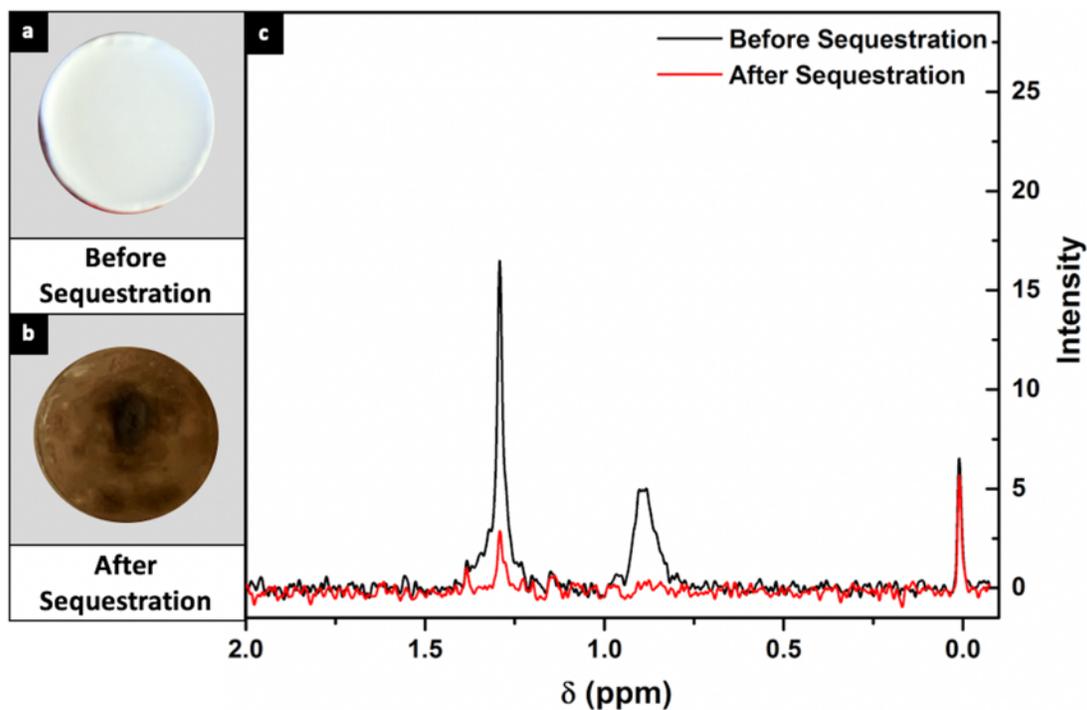


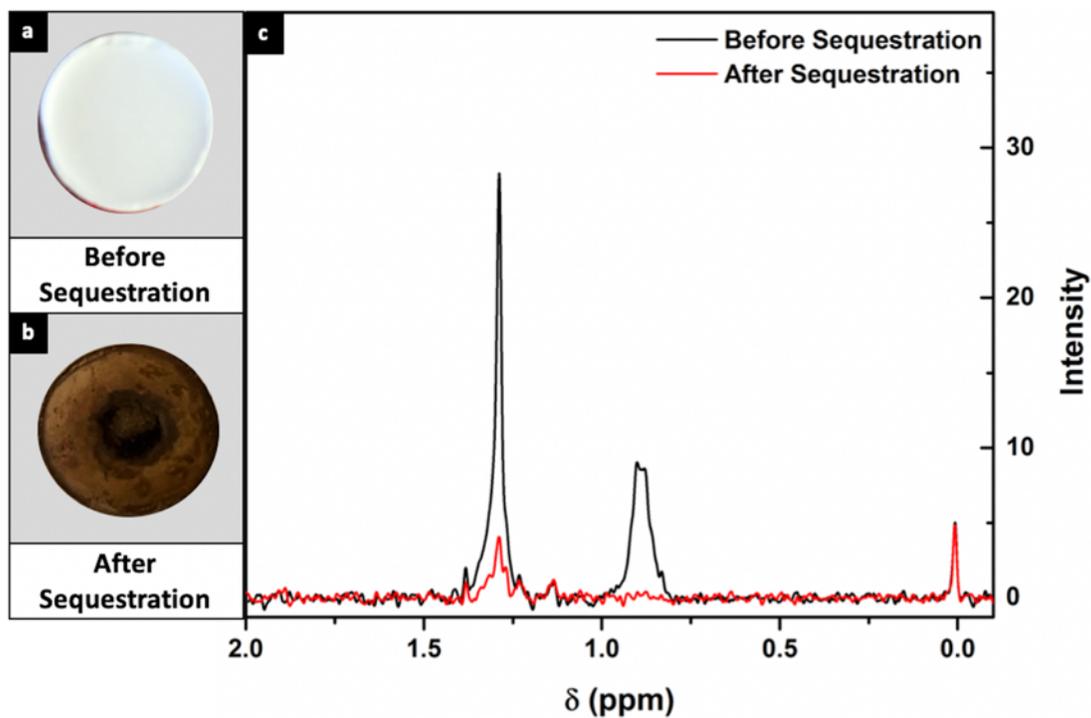
Fig. S3 a) Image of liquid in vials before and after filtration via MHO ceramic monolith in basic pH, b) Overlaid GC-MS chromatograms of liquid-oil mixture before sequestration (green) and recovered liquid after sequestration using commercial wine filter (purple) and MHO ceramic monolith (black).



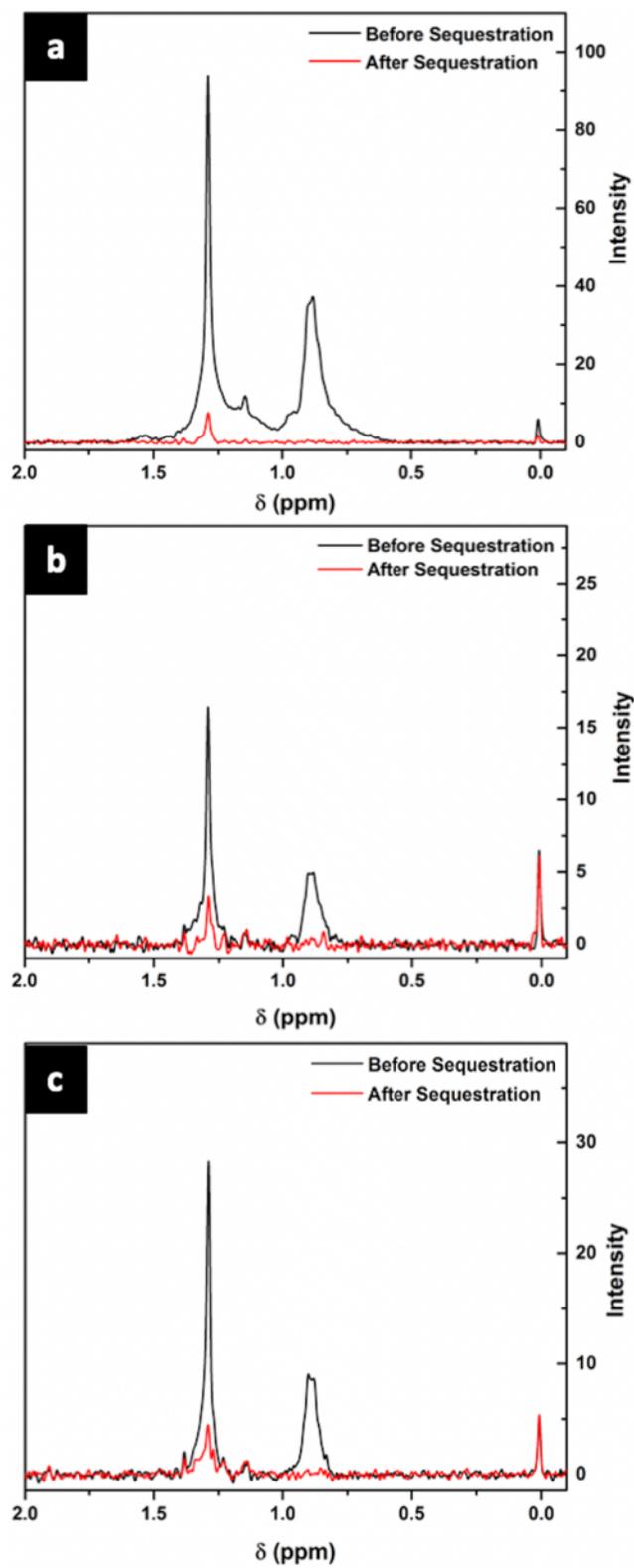
**Fig. S4**  $^1\text{H}$  NMR spectrum of blank solution consisting of deuterated methanol, deuterated chloroform with tetramethylsilane (99.5% + 0.05%), and nanopure water.



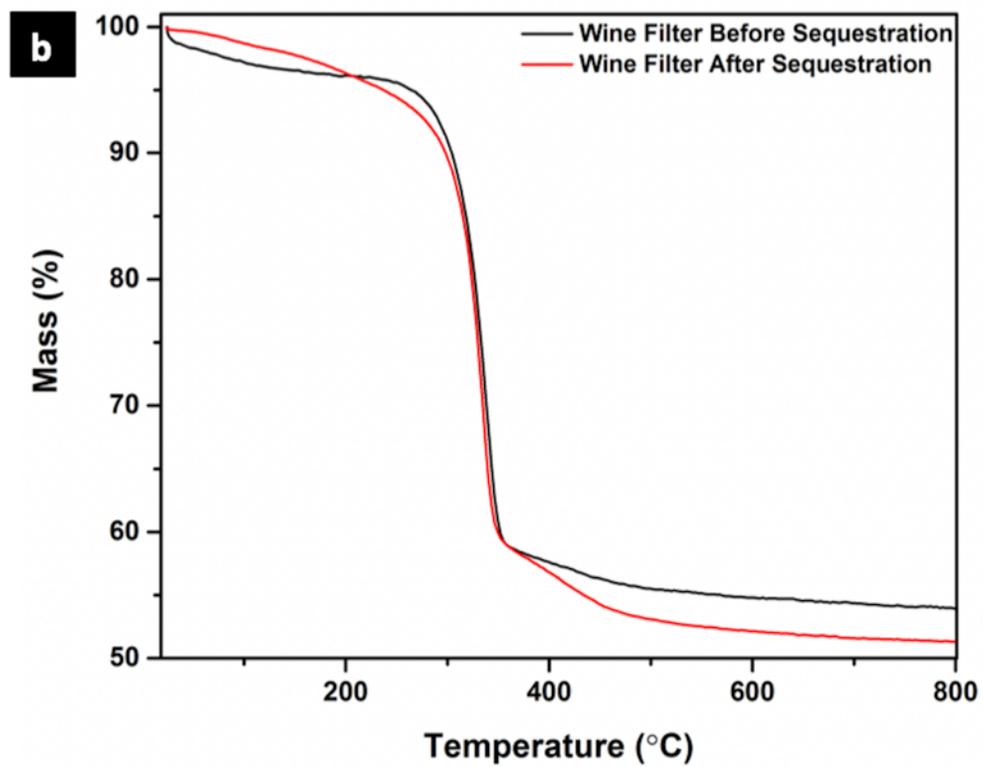
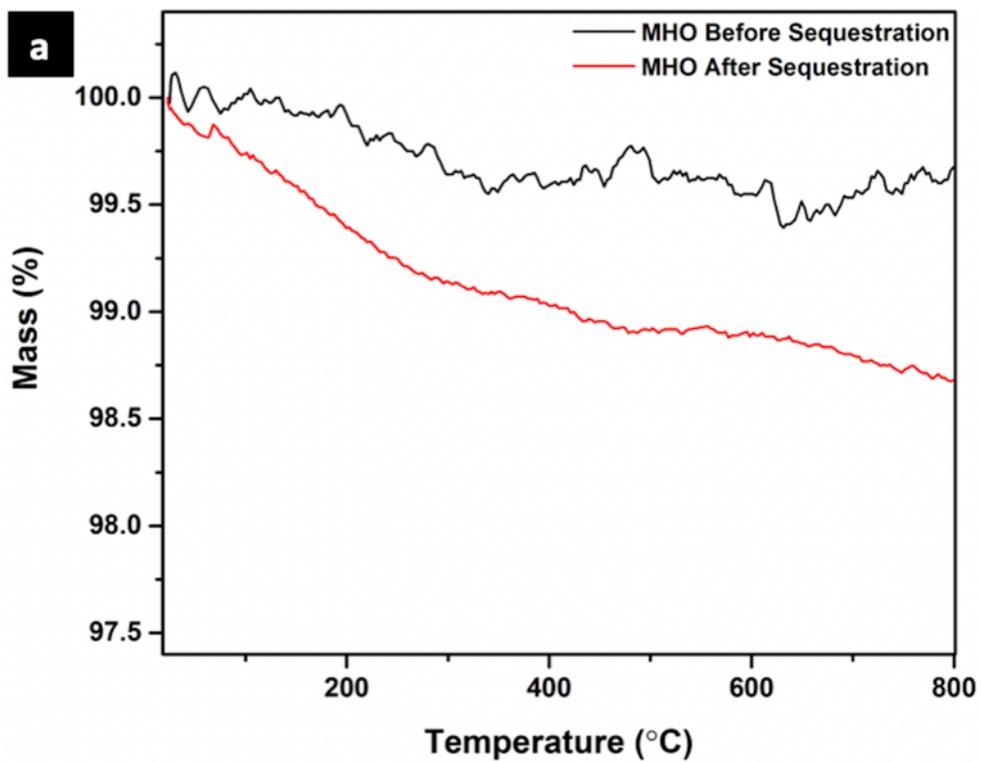
**Fig. S5** a) Top view of MHO ceramic before sequestration, b) Top view of MHO ceramic after sequestration of crude oil-water emulsion in acidic pH, c)  $^1\text{H}$  NMR spectrum of liquid before and after sequestration with MHO ceramic.



**Fig. S6** a) Top view of MHO ceramic before sequestration, b) Top view of MHO ceramic after sequestration of crude oil-water emulsion in basic pH, c)  $^1\text{H}$  NMR spectrum of liquid before and after sequestration with MHO ceramic.



**Fig. S7** <sup>1</sup>H NMR spectrum of liquid before and after sequestration with commercial wine filter in a) Neutral pH, b) Acidic pH, c) Basic pH.



**Fig S8** a) TGA of MHO ceramic before sequestration (black) and after crude oil sequestration (red) in neutral pH under argon, b) TGA of commercial wine filter before sequestration (black) and after crude oil sequestration (red) in neutral pH under argon.

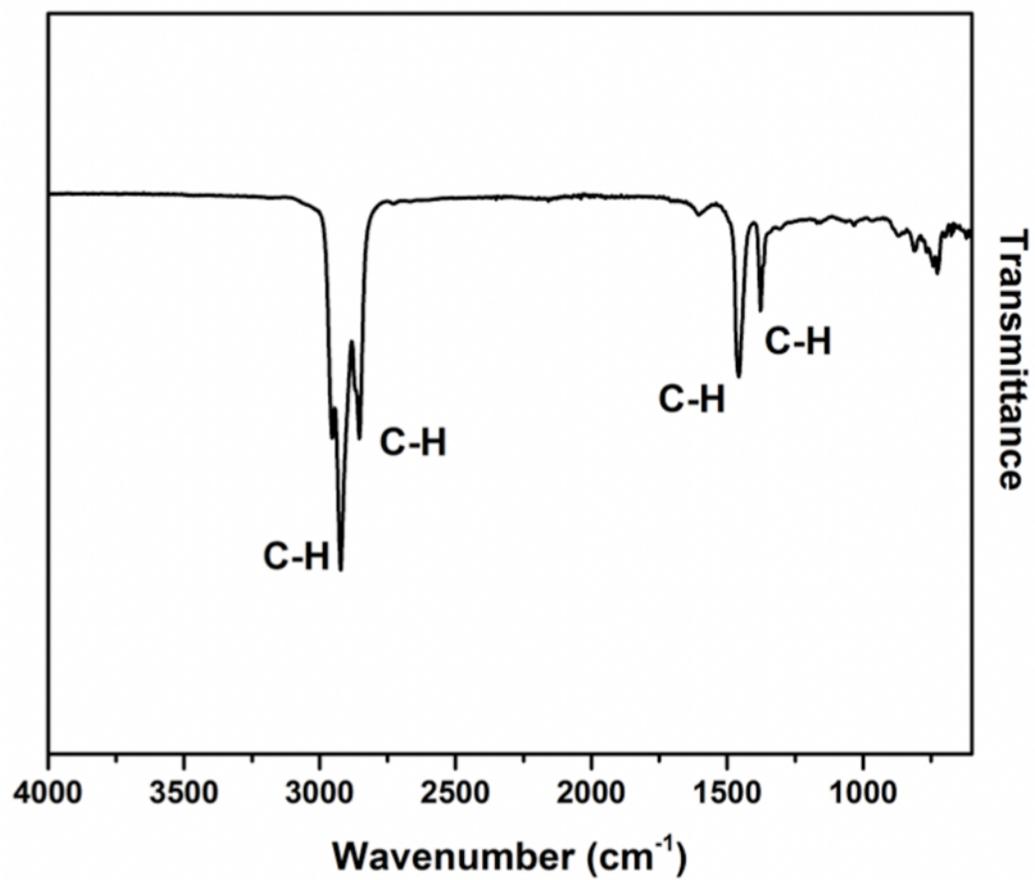


Fig. S9 ATR-FTIR of Crude Oil with major peaks labelled.

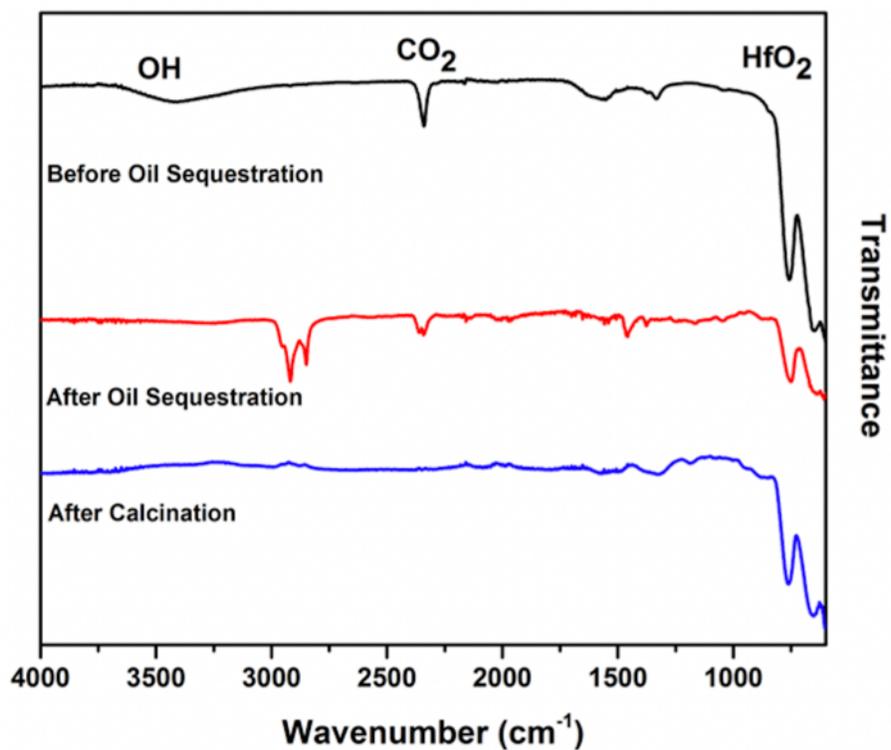


Fig. S10 ATR-FTIR spectrum of MHO ceramic before sequestration, after sequestration in acidic pH, and after calcination.

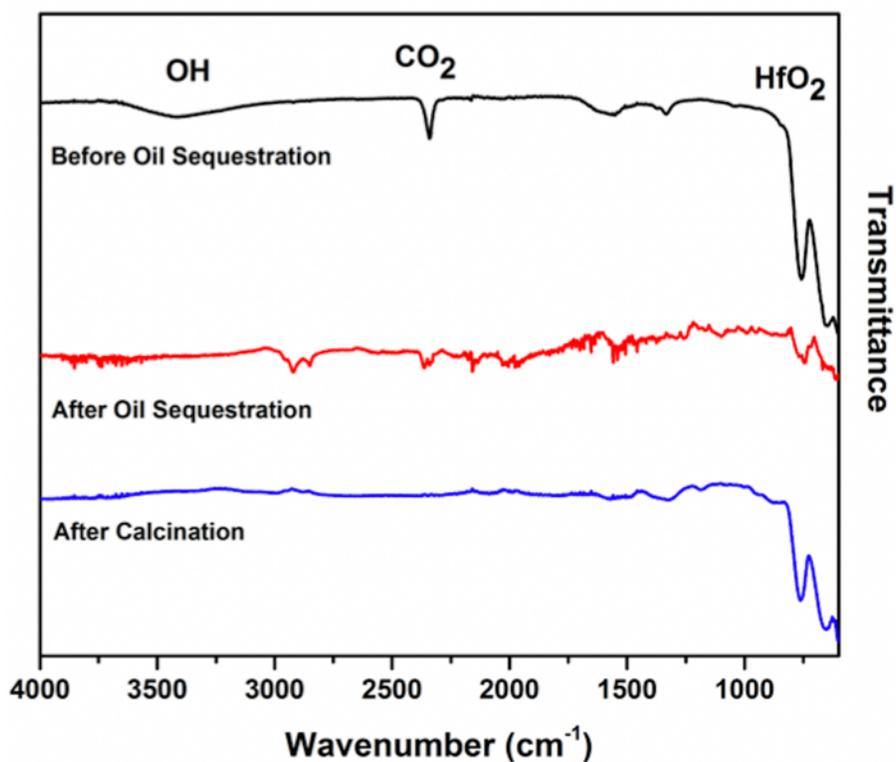


Fig. S11 ATR-FTIR spectrum of MHO ceramic before sequestration, after sequestration in basic pH, and after calcination.

**Table S1.** Comparison of MHO ceramic with various oil sorbent materials.

Material	% Removal	Emulsified?	Renewable?	Reference no.
Polyurethane sponge modified with hydrophobic silica nanoparticles	92	no	no	16
TiO <sub>2</sub> membrane	99.56	yes	no	41
Multiwalled carbon nanotube	85	yes	yes	42
In situ formed magnesium hydroxide	99	yes	yes	43
Wine filter	99.9	yes	no	This work
Mesoporous Hafnium Oxide Ceramic	99.9	yes	yes	This work