

Front. Chem. Sci. Eng.

DOI 10.1007/s11705-017-1657-8

RESEARCH ARTICLE

Merits and limitations of TiO₂-based photocatalytic pretreatment of soils impacted by crude oil for expediting bioremediation

Yu Yang¹, Hassan Javed^{1,2}, Danning Zhang¹, Deyi Li³, Roopa Kamath⁴, Kevin McVey⁴, Kanwatej Sra⁴, Pedro J.J. Alvarez(✉)¹

1 Department of Civil and Environmental Engineering, Rice University, Houston, TX 77005, USA

2 Department of Chemistry, Rice University, Houston, TX 77005, USA

3 Department of Civil and Environmental Engineering, Tongji University, Shanghai 200092, China

4 Chevron Energy Technology Company, Houston, TX 77002, USA

© Higher Education Press and Springer-Verlag Berlin Heidelberg 2017

E-mail: alvarez@rice.edu

Electronic Supplementary Materials

Materials and Method

Determination of soil water holding capacity. One filter paper was folded to form a cone and inserted into a funnel. The filter was completely saturated with water and held for 30 min to let excess water drain. Twenty grams of soil was added in the filter cone, and 50 ml water was poured onto the soil. A graduated cylinder was placed under the funnel and used to collect the water draining through the funnel. After 30 min, the volume of the water (V) in the cylinder was recorded.

The water holding capacity (ml H₂O/ g soil) = (50 ml H₂O-V)/20 g soil

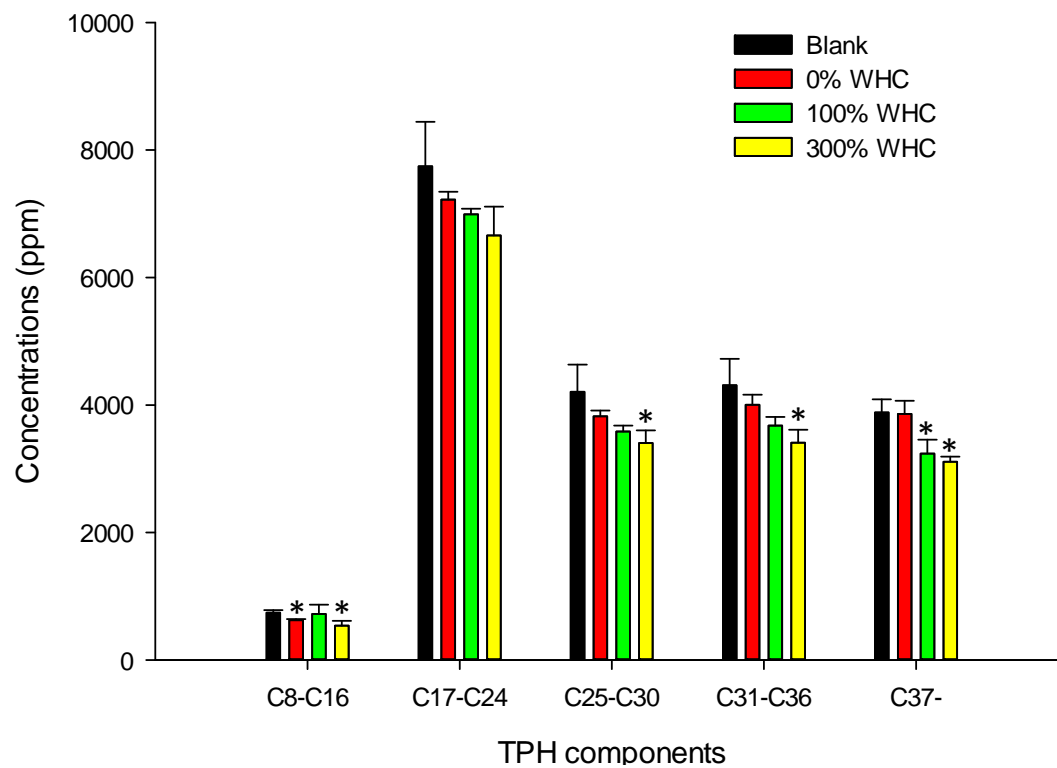


Figure S1. Different molecular weight fractions of TPH in the contaminated soil with soil moisture at 0%, 100% and 300% WHC. Asterisks (*) indicate significant increases compared to the control ($p < 0.05$). Error bars represent \pm one standard deviation from the mean of triplicate measurements.

Table S1. Characterization of oil-impacted soil.

LBC ¹ (ppm CaCO ₃ / pH)	N.A.
pH _{CaCl₂} ²	7.66
Equiv. water pH	8.26
Base Saturation (%)	100.0
CEC (meg/100 g)	30.41
Ca (ppm)	4900
Cd (ppm)	<0.03
Cr (ppm)	<0.04
Cu (ppm)	<0.17
Fe (ppm)	0.4
K (ppm)	94.84
Mg (ppm)	221.2
Mn (ppm)	11.08
Mo (ppm)	<0.04
Na (ppm)	879.8
Ni (ppm)	0.08
P (ppm)	1.83
Pb (ppm)	0.58
Zn (ppm)	<0.17