Supplementary material to

Removal of diesel pollution by biochar – support in water remediation

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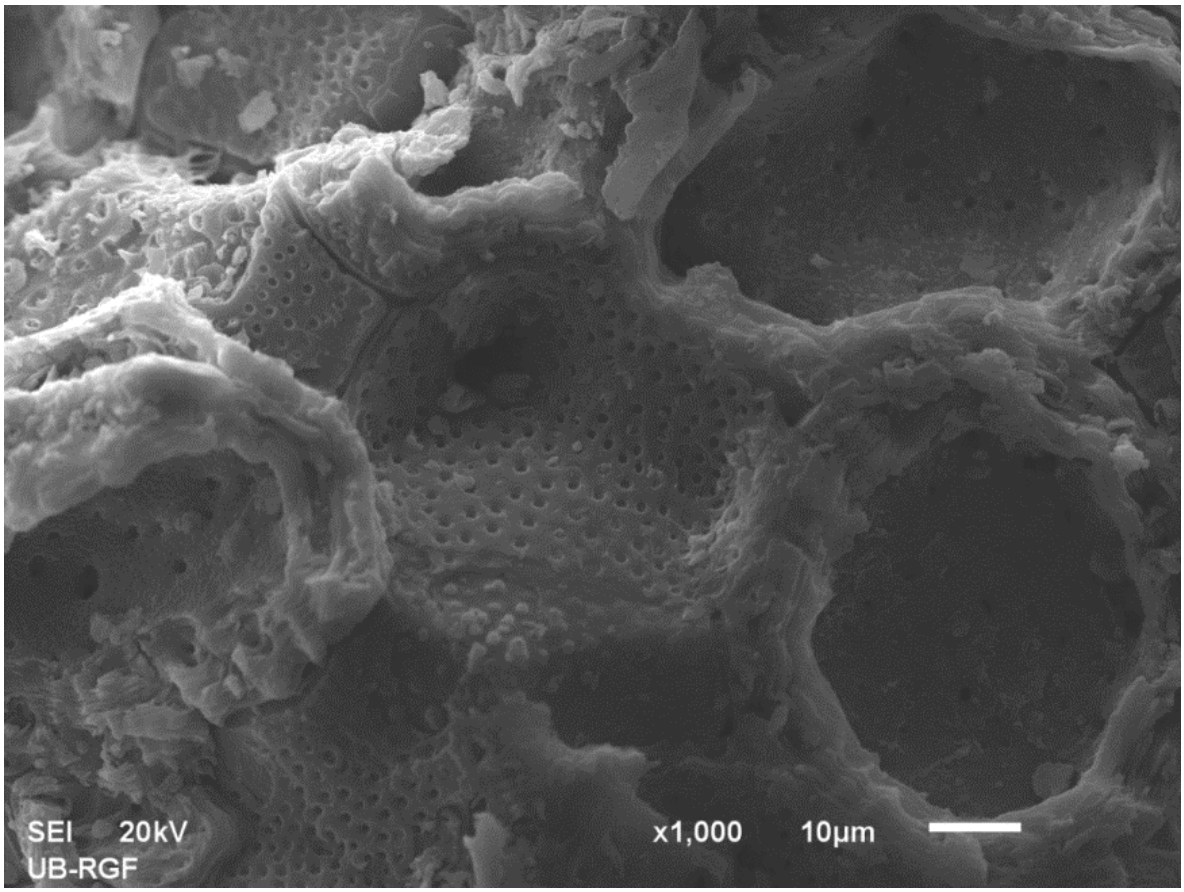

Figure D-1. SEM micrograph of peach stone sample (PS) used for biochar preparation

Experimental isotherm data were modelled using Langmuir isotherm model [1] as well as Freundlich isotherm model [2]. Obtained isotherm parameters are given in the Table D-1.

Table D-1. Results of diesel WSF sorption on PS-B fitted with Langmuir and Freundlich isotherm models

Model	Parameter	Value	Standard error	R^2	χ^2
Langmuir	q_m/ mg g^{-1}	64.97	137.95	0.8847	1.679
	K_L / dm^{-3} mg^{-1}	0.133	0.3246		
Freundlich	K_F/ mg g^{-1} (dm^{-3}mg^{-1})$^{1/n}$	7.242	0.2592	0.9773	0.331
	$1/n$	0.705	0.1287		

As it can be seen from Table D-1, Freundlich isotherm model better describes sorption phenomena of water soluble fraction of diesel oil than Langmuir model. However, for the purpose of comparison with other biochar sorbents which were used for similar purpose, value of maximum sorption capacity (q_m) obtained from Langmuir model was used.

Table D-2. Comparison of maximum sorption capacity of diesel oil and its fractions (obtained by Langmuir isotherm model) by different biochar sorbents

Sorbent	Sorbate	C_i /mg dm^{-3}	T / °C	q_m / mg g^{-1}	Reference
Crab shell biochar Alkali impregnated crab shell biochar	Diesel oil	100-500	30	30.71 57.74	[3]
Alkali modified *Sterculia foetida* (Indian almond nutshell) biochar	PAH-acenapthene PAH-naphthalene	2-10	20-35	18.55-22.18 19.07-22.55	[4]
Post harvested residue	Diesel oil	19.3	25	23.10	[5]
Rice husk biochar Saw dust biochar	Crude oil	7143	-	3230 2400	[6]
Peach stone biochar	Diesel oil	2-20	25	64.97	This paper

Looking at scientific literature, it was difficult to find data which might be comparable with the ones described in this paper. In most cases, biochar was used in order to stabilize soil and remove diesel fractions present in it. For example, Jiang *et al.* [5] have found that biochar made from post-harvest residue has significant effect on sorption of petroleum pollutants in loess soil, resulting in maximum sorption capacity of 23.10 mg g^{-1} when the biochar made at 600 °C was applied. Besides this, they have also found that the adsorption equilibrium data were better described by the Freundlich than by Langmuir isothermal model. In the recently published paper by Barman *et al.*, [4] water soluble PAH fractions of diesel oil-acenapthene (ACA) and naphthalene (NAP) were sorbed by biochar made from Indian almond nutshells. Obtained data indicated that maximum sorption capacities were in the range of 18.55 to 22.18 and 19.07 to 22.55 mg g^{-1} for ACA and NAP, respectively. Isotherm data were fitted best by Langmuir and Temkin models, indicating monolayer and homogenous PAH sorption with strong chemical interaction among sorbate and sorbent molecules.
Other papers found in literature mostly deal with sorption of much higher diesel oil initial concentrations, including both soluble and the floating fraction as well.

REFERENCES

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