Supplementary Information

Article

Optimization of pyrolysis parameters by design of experiment for the production of biochar from sewage sludge

Giacomo Cedrone [1], Maria Paola Bracciale [2], Lorenzo Cafiero [1], Michela Langone [3], Davide Mattioli [4], Marco Scarsella [2], Riccardo Tuffi [1,*]

[1] Department for Sustainability, ENEA – Casaccia Research Center, Via Anguillarese 301, S. Maria di Galeria, Rome, Italy
[2] Department of Chemical Engineering, Sapienza University of Rome, Via Eudossiana 18, Rome, Italy
[3] Department for Sustainability, ENEA – Portici Research Center, P.le Enrico Fermi 1, Portici, Napoli, Italy
[4] Department for Sustainability, ENEA – Bologna Research Center, Via Martiri di Monte Sole 4 , Bologna, Italy
* Correspondence: riccardo.tuffi@enea.it; Tel.: +390630484335

Table S1. TGA thermal program for proximate analysis.

Atmosphere	**Temperature program**			
	T_i **(°C)**	T_f **(°C)**	$\beta = dT/dt$ **(°C·min^{-1})**	Δt **isotherm (min)**
N_2 at 60 mL/min	25		--	5
	25	105	20	--
	105		--	15
	105	900	20	--
	900		--	5
Air at 90 mL/min	900		--	30



Figure S1. Dried sewage sludge out from the oven.

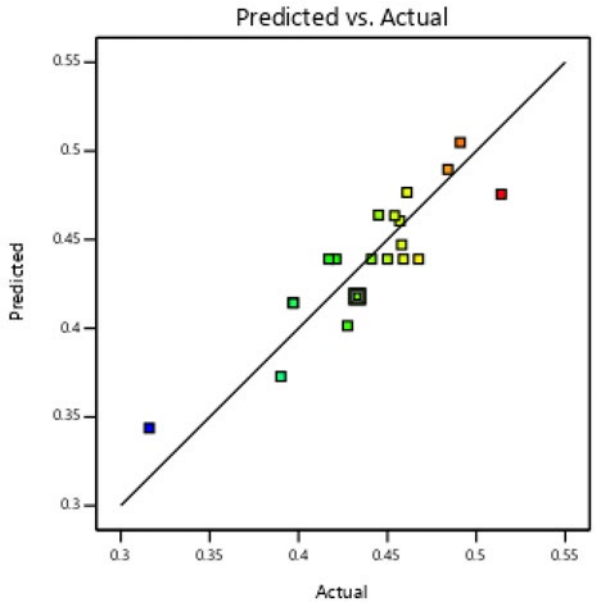


Figure S2. Actual vs. predicted plot of CO_2 adsorption capacity ($molCO_2/kg$).

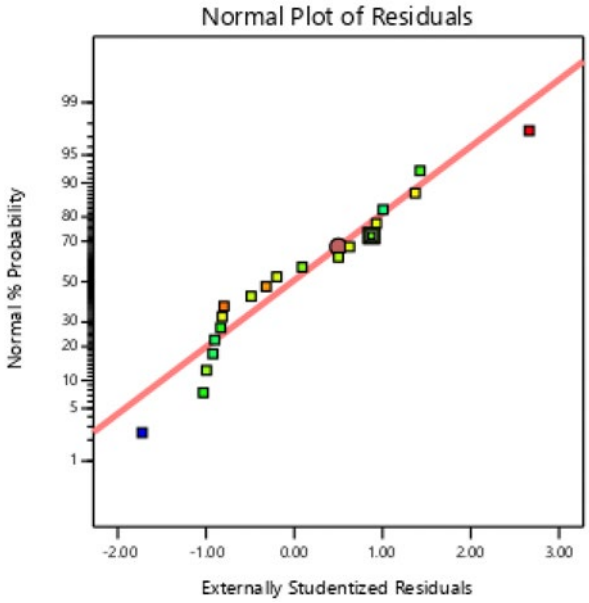


Figure S3. Normal probability plot of CO_2 adsorption capacity residuals.

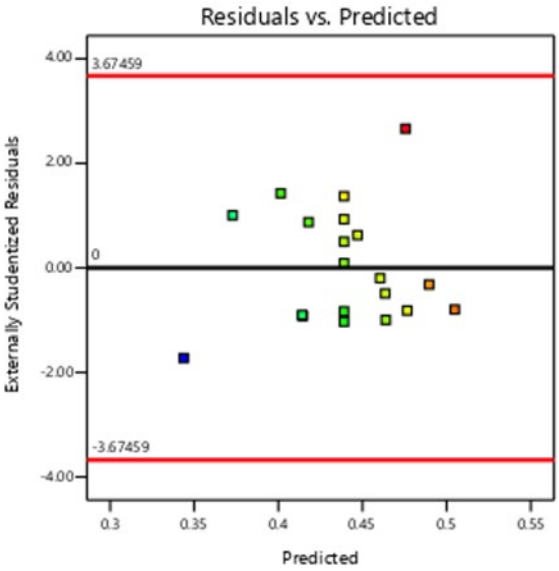


Figure S4. Residuals vs. predicted values of CO_2 adsorption capacity (molCO_2/kg).

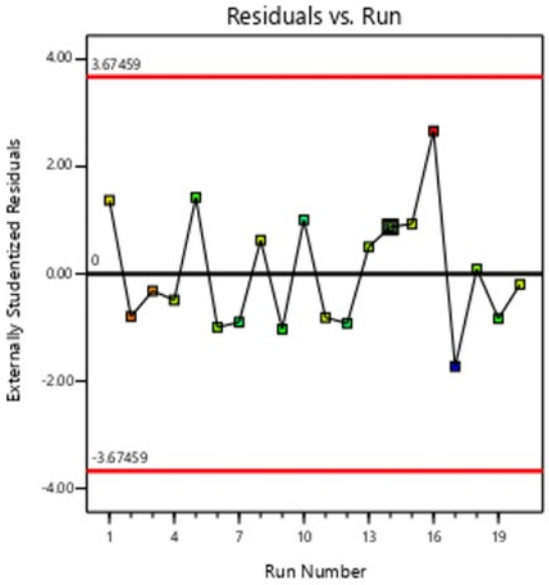


Figure S5. Residuals vs. run number of CO_2 adsorption capacity.

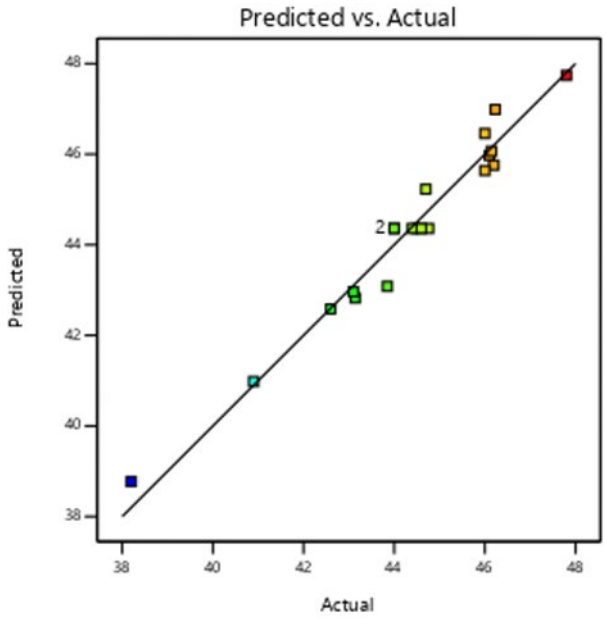


Figure S6. Actual vs. predicted plot of biochar yield (wt%).

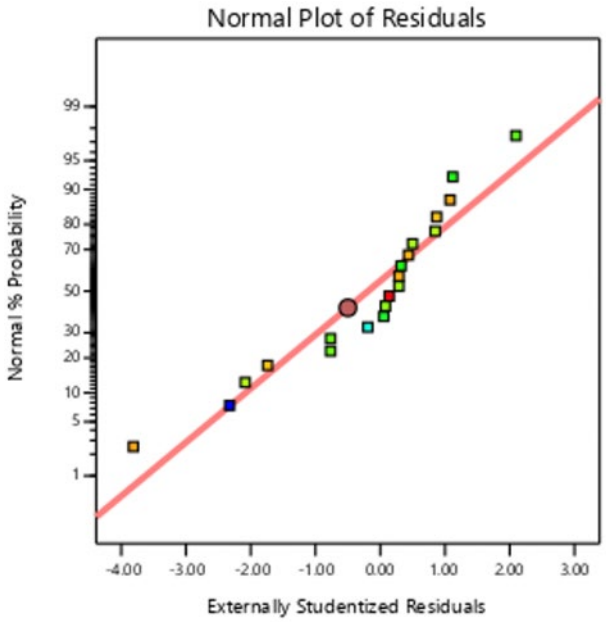


Figure S7. Normal probability plot of biochar yield residuals.

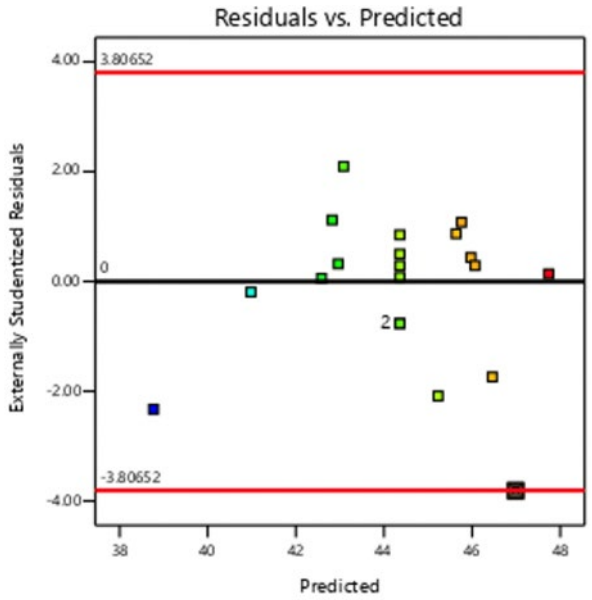


Figure S8. Residuals vs. predicted values of biochar yield (wt%).

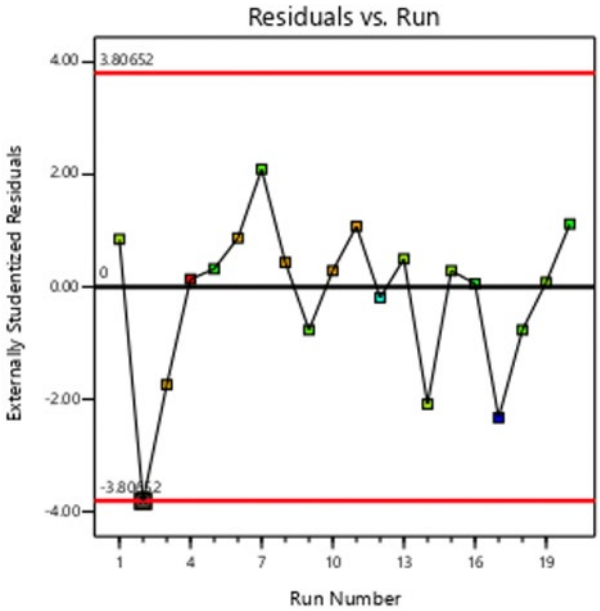


Figure S9. Residuals vs. run number of biochar yield.

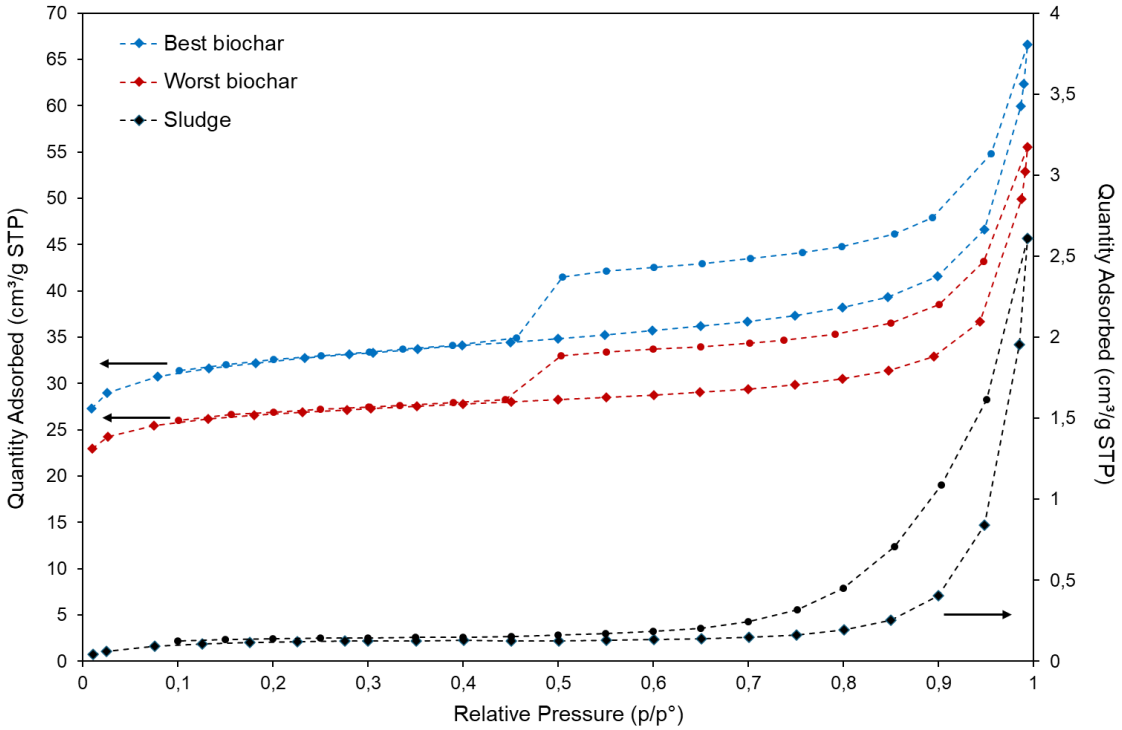


Figure S10. N_2 adsorption-desorption isotherms of dried sewage sludge. "best" and "worst" biochar.

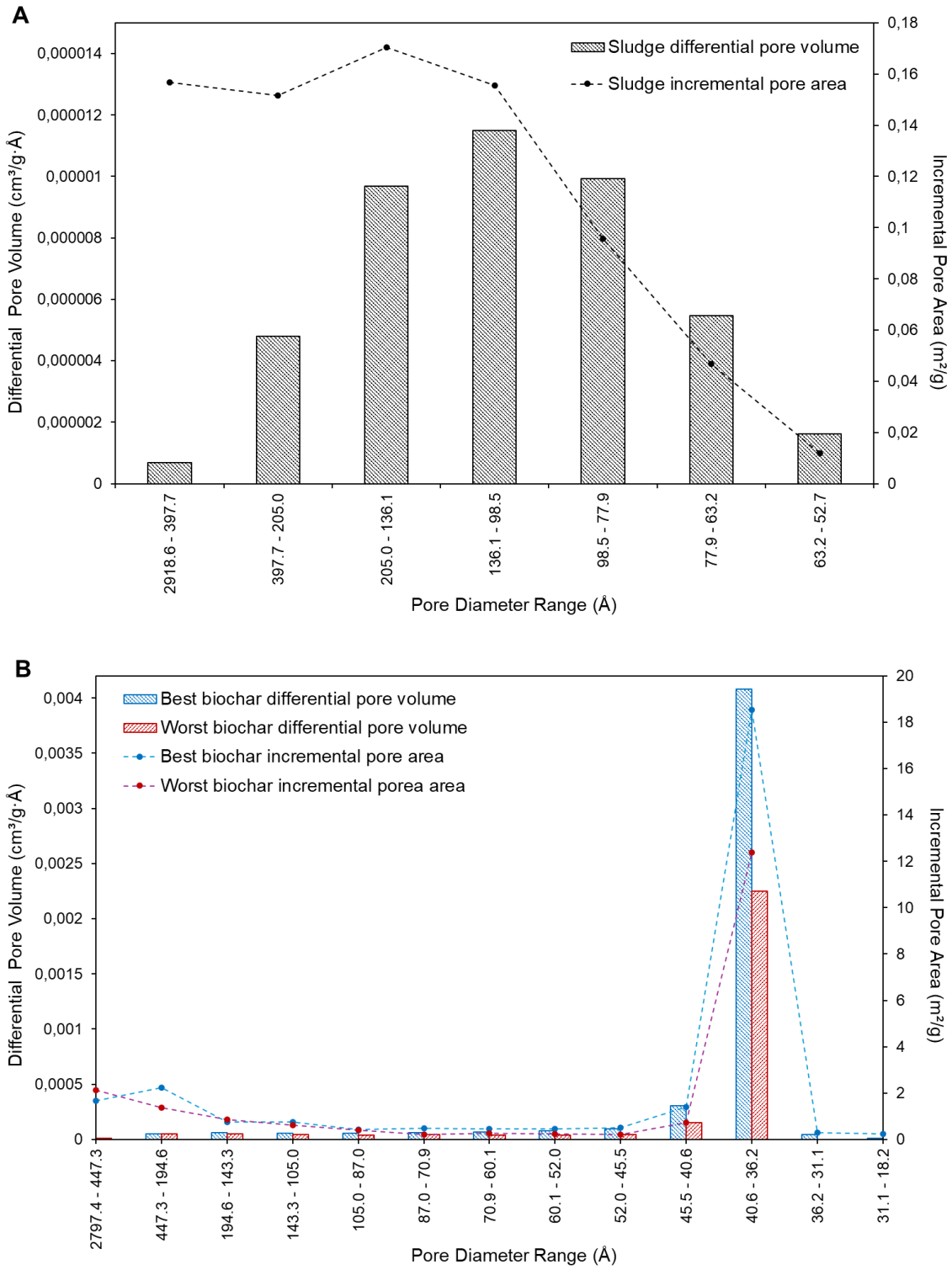


Figure S11. Pore volume distribution and incremental pore area of (A) dried sewage sludge. (B) "best" and "worst" biochar.