

Supplementary Material

Supplementary Table S1

Particle size, surface area, and pore characteristics of minerals and PyOM (n = 2 for particle size and n = 1 for surface area and pore characteristics).

		PZC ^a	pH	D _{mean} ^d (μm)	D ₁₀ ^d (μm)	D ₉₀ ^d (μm)	A _{BET} ^e (m ² /g)	V _P ^f (cm ³ /g)	D _P ^g (nm)
Mineral	Quartz	2-3 ^b	5.7	24.3	2.62	53.2	0.898	0.001	4.95
	Corundum	9.2 ^b	8.6	4.2	1.13	8.15	2.62	0.006	8.91
	Goethite	9.2 ^c	6.5	39.7	1.04	83.0	35.1	0.033	3.81
	Kaolinite	4-5 ^b	7.0	10.7	2.75	21.5	6.90	0.027	15.7
Char	Corn stover	nd	9.0	14.9	2.98	31.8	451	0.187	1.65
	Cellulose	nd	6.5	30.4	8.92	53.9	522	0.211	1.62
	Glucose	nd	8.2	29.2	7.03	53.8	494	0.194	1.57
	Lignin	nd	10.8	25.9	8.01	45.2	304	0.105	1.38
	Arginine	nd	6.3	30.1	7.53	55.9	3.28	0.002	2.02

^a Point of Zero Charge; ^b Beak et al. (2006); ^c Kosmulski (2014); ^d mean diameter and diameter at 10% or 90% of accumulated volume;

^e BET specific surface area; ^f pore volume; ^g average pore size.

nd, not determined.

Supplementary Table S2

The effect of mineral or organic matter variation on cumulative CO₂-C mineralization (f_{C,M}) of charred and uncharred organic matter (n=20). Statistical results are based on the Tukey's HSD test at P<0.05.

		Mineralization				
			mean	SD ^e	%RSD ^f	P ^h
UC ^a	M effect ^c	CS	0.533 b ^g	0.067	12.5 b ^g	0.000
		Cel	0.150 c	0.097	64.8 a	
		Glu	0.849 a	0.074	8.73 b	
		Lig	0.097 d	0.009	9.92 b	
		Arg	0.132 cd	0.071	53.8 a	
	OM effect ^d	Q	0.339 a	0.315	93.1 a	0.980
		C	0.344 a	0.327	95.0 a	
		G	0.394 a	0.297	75.3 a	
		K	0.334 a	0.314	94.0 a	
		K+G	0.352 a	0.303	86.1 a	
C ^b	M effect ^c	CS	0.0529 c	0.006	11.3 a	0.000
		Cel	0.0461 d	0.007	15.7 a	
		Glu	0.0472 d	0.004	8.74 a	
		Lig	0.0598 b	0.006	10.9 a	
		Arg	0.0677 a	0.007	10.6 a	
	OM effect ^d	Q	0.0502 b	0.010	19.9 a	0.061
		C	0.0560 ab	0.010	18.5 a	
		G	0.0531 ab	0.009	17.9 a	
		K	0.0550 ab	0.009	17.2 a	
		K+G	0.0594 a	0.011	17.8 a	

^a Uncharred; ^b charred; ^c mineral type effect; ^d organic matter type effect; ^e standard deviation; ^f relative standard deviation;

^g identical letters indicate no statistical difference, within a given group;

^h P value of the main M or OM effect; CS: corn stover; Cel: cellulose; Glu: glucose; Lig: lignin; Arg: arginine; Q: quartz; C: corundum; G: goethite; K: kaolinite.

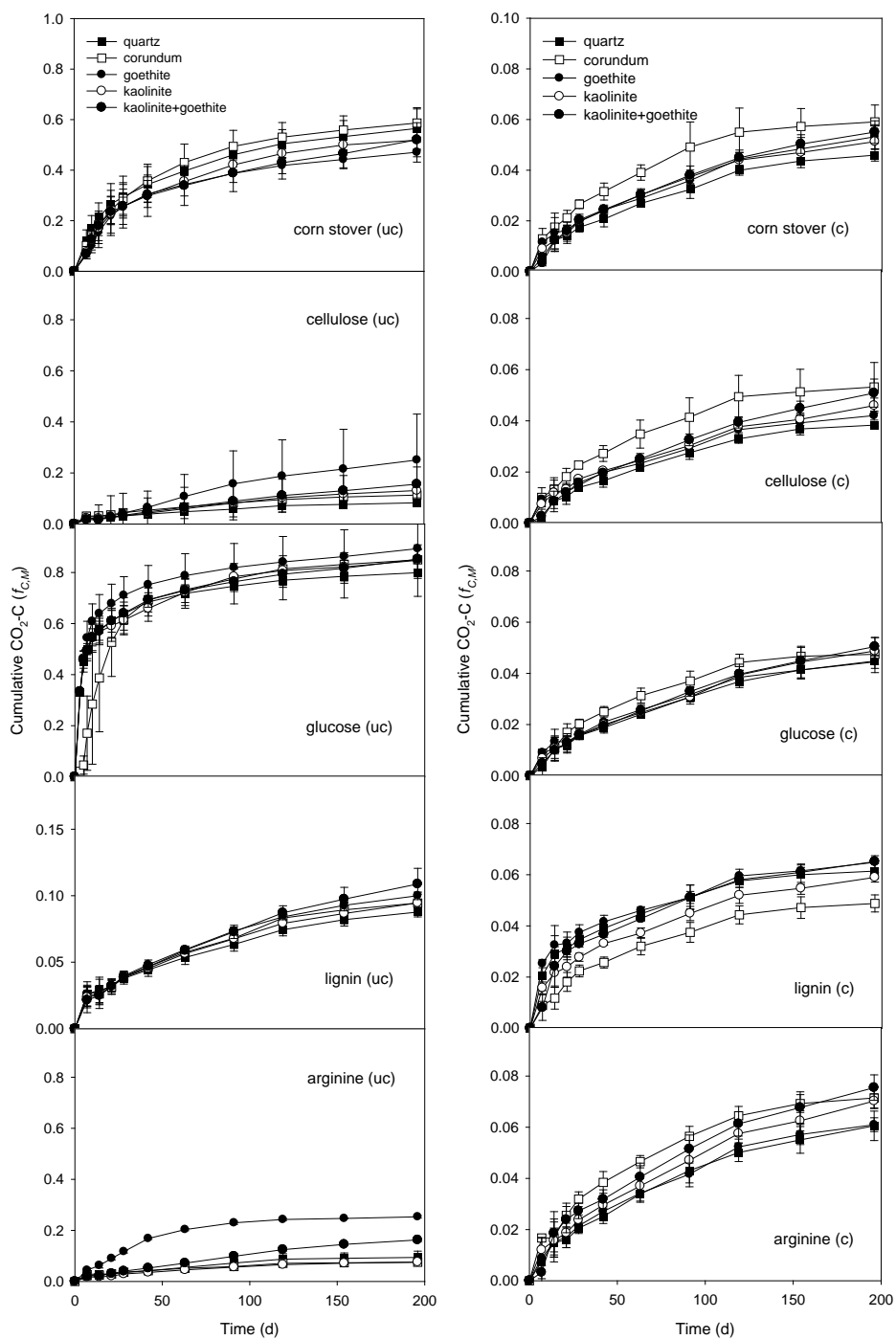
Supplementary Table S3

Relative contribution (RSD ratio) of effect of mineralogy on uncharred and charred OM mineralization to C debt or credit ratio calculation (dimensionless; a RSD ratio value of 1 would indicate that the contribution of mineralogy to the sum of mass loss by charring and mineralization are identical for both charred and uncharred OM) with the data sets for the same original feedstock but different mineral types (n=20).

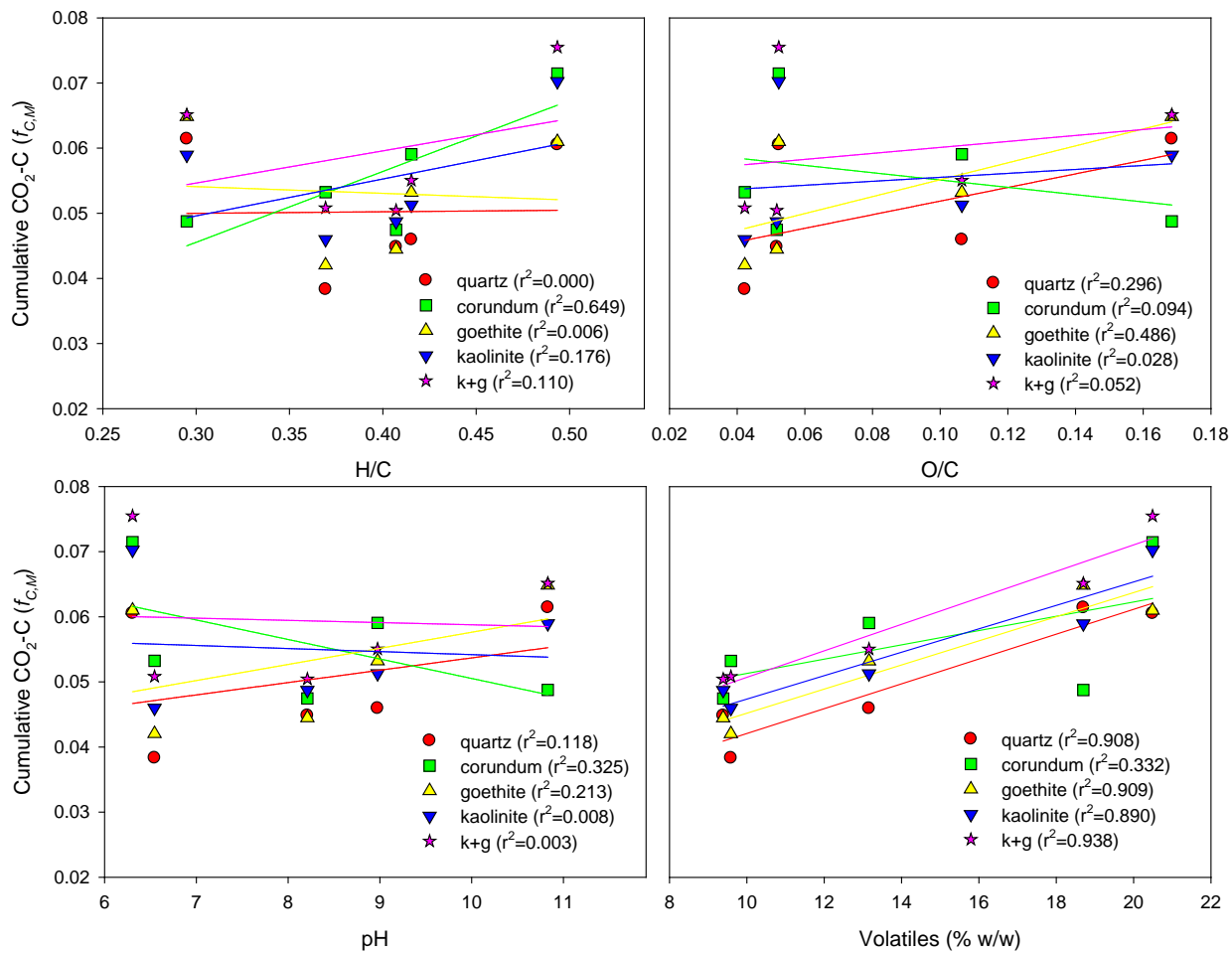
		Corn stover	Cellulose	Glucose	Lignin	Arginine
Uncharred	Average	0.468	0.824	0.163	0.903	0.868
	SD ^a	0.065	0.148	0.0555	0.01	0.071
	%RSD ^b	13.9	18.0	34.1	1.07	8.19
Charred	Average	0.448	0.410	0.244	0.609	0.292
	SD ^a	0.003	0.003	0.001	0.004	0.002
	%RSD ^b	0.631	0.761	0.433	0.693	0.770
RSD ratio ^c		0.045	0.042	0.013	0.649	0.094

^a Standard deviation; ^b relative standard deviation;

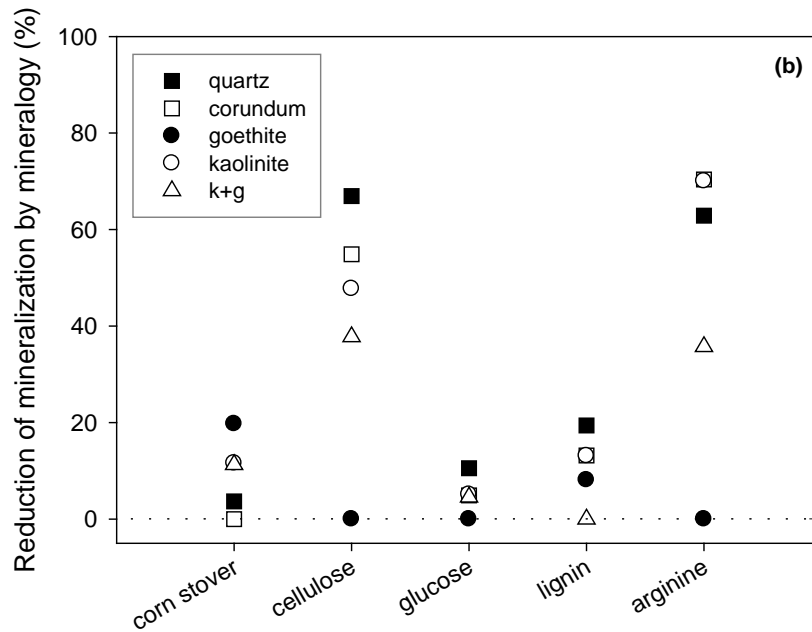
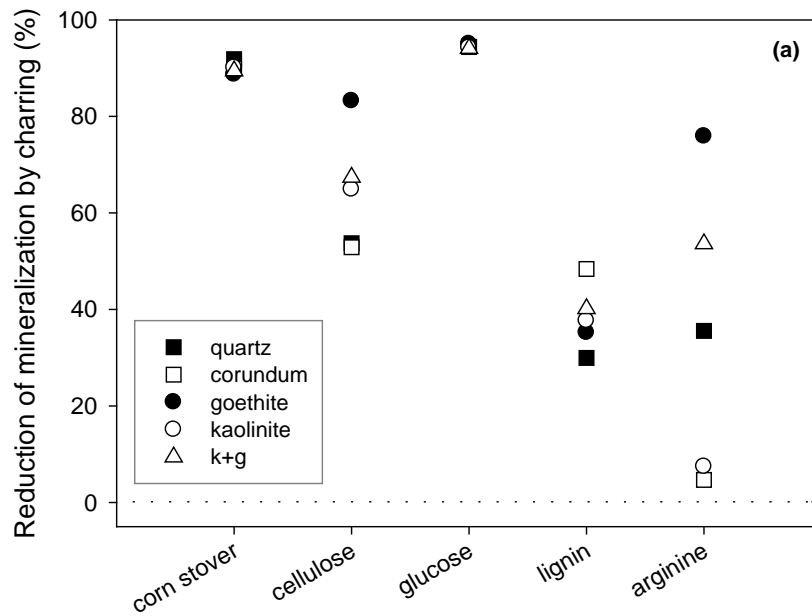
^c RSD for charred/RSD for uncharred.



Supplementary Fig. S1. Cumulative CO₂ evolution during incubation with the various combinations of minerals and charred (c) or uncharred (uc) OM (mean and standard deviation; n = 4).



Supplementary Fig. S2. Relationship between H/C, O/C, pH, volatiles (% w/w of PyOM) of charred organic matter and cumulative CO₂ evolution shown separately for each mineral. Lines indicate linear regressions of 5 data points of different material combinations. Each data point represents the mean of 4 experimental replicates.



Supplementary Fig. S3. Reduction of mineralization of organic matter by charring (a) and by mineralogy (b) after 196 days of incubation (n=20). The values in (b) were calculated on the baseline of the most rapidly mineralized organic material that was set to zero.

References

Beak, D.G., Basta, N.T., Scheckel, K.G., Traina, S.J. 2006. Bioaccessibility of lead sequestered to corundum and ferrihydrite in a simulated gastrointestinal system. *Journal of Environmental Quality* 35, 2075-2083.

Kosmulski, M., 2014. The pH dependent surface charging and points of zero charge. VI. Update. *Journal of Colloid Interface Science* 426, 209-212.