

Potential sustainable slow-release fertilizers obtained by mechanochemical activation of MgAl and MgFe layered double hydroxides and K_2HPO_4 .

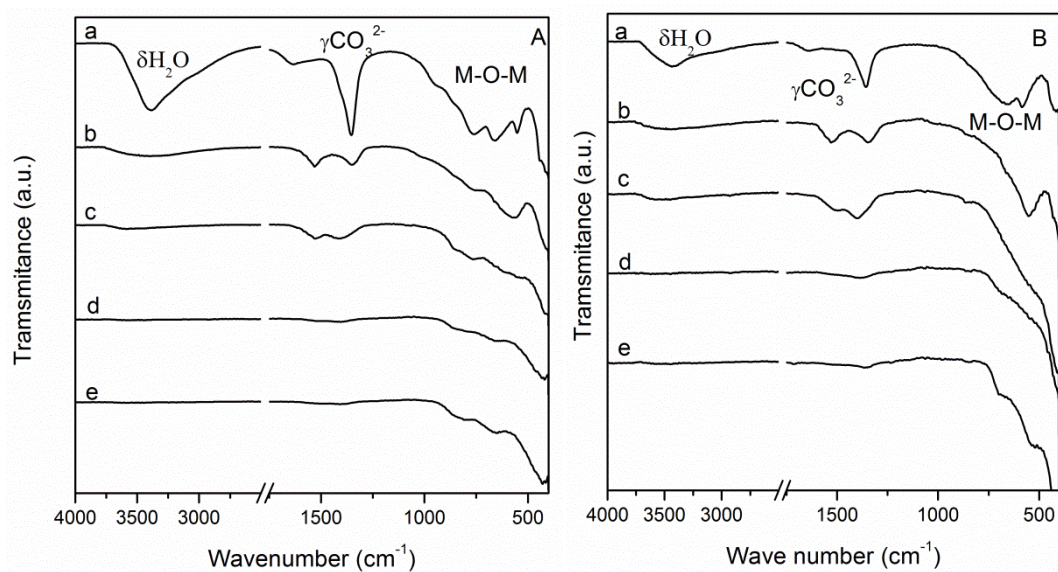


Figure S1. FTIR data of A) $Mg_2Al(OH)_6(CO_3) \cdot 3H_2O$ (a), MgAl calcined at: 200 °C (b); at 300 °C (c); at 400 °C (d) and at 500 °C (e) and B) $(Mg_2Fe(OH)_6(CO_3) \cdot 2.5H_2O$ (a), MgFe calcined at: 200 °C (b); at 300 °C (c); at 400 °C (d); and at 500 °C (e).

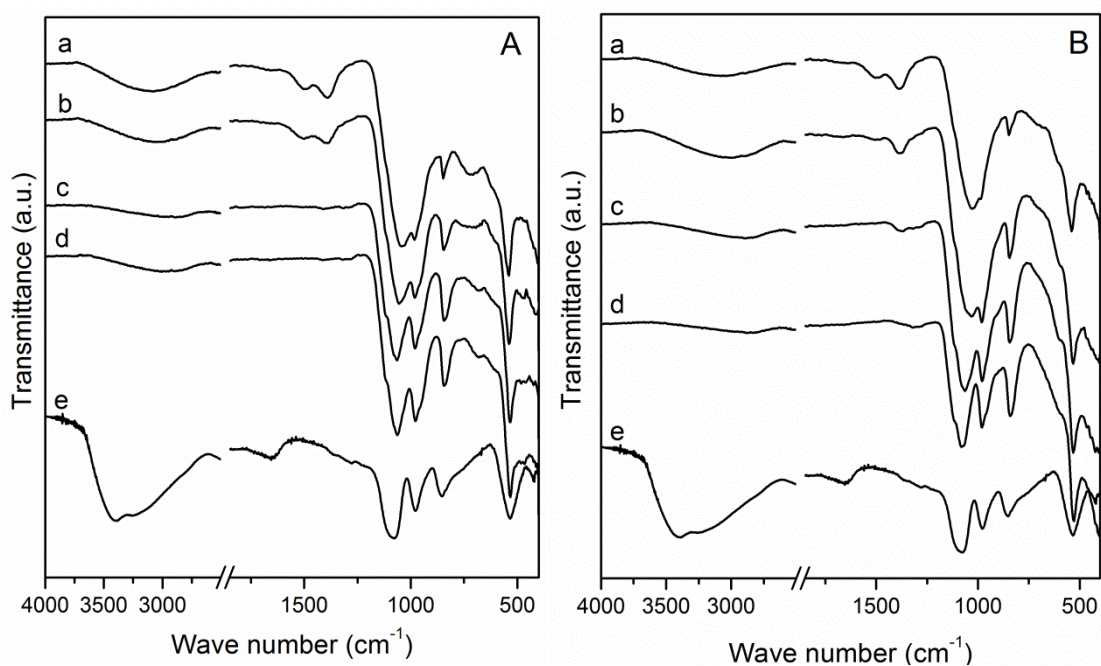


Figure S2: FTIR data of milled samples (9 h, 450 rpm) A) $\text{MgAl}_{200}/\text{K}_2\text{HPO}_4$ (a); $\text{MgAl}_{300}/\text{K}_2\text{HPO}_4$ (b); $\text{MgAl}_{400}/\text{K}_2\text{HPO}_4$ (c); $\text{MgAl}_{500}/\text{K}_2\text{HPO}_4$ (d), K_2HPO_4 (e), and B) $\text{MgFe}_{200}/\text{K}_2\text{HPO}_4$ (a); $\text{MgFe}_{300}/\text{K}_2\text{HPO}_4$ (b); $\text{MgFe}_{400}/\text{K}_2\text{HPO}_4$ (c); $\text{MgFe}_{500}/\text{K}_2\text{HPO}_4$ (d), K_2HPO_4 (e) with LDH/ K_2HPO_4 MR 1:2.

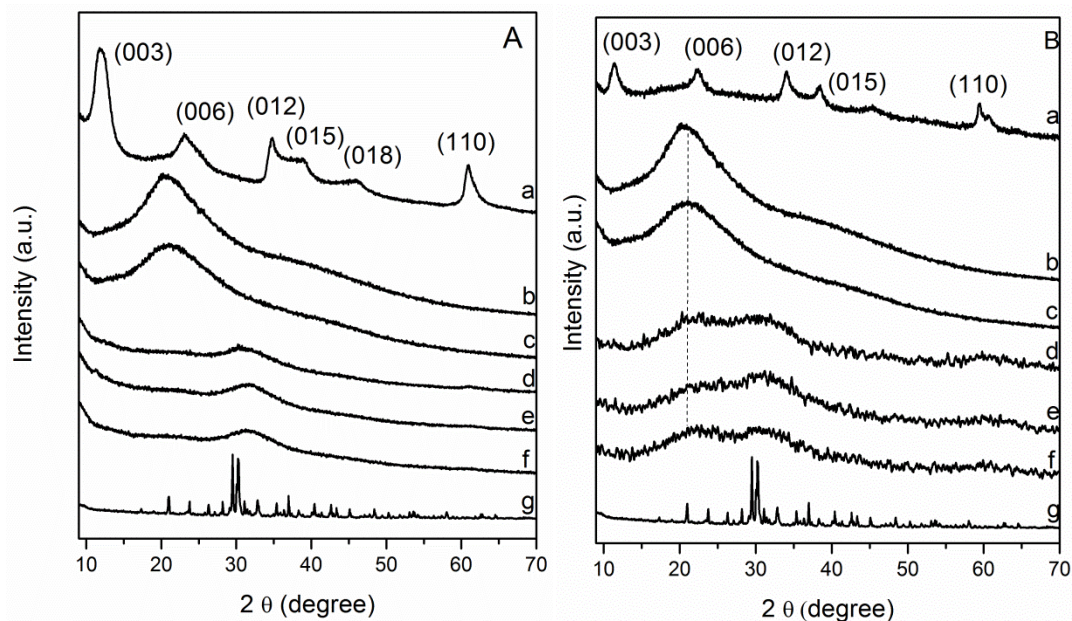


Figure 3. XRD for A) MgAl (a), CMC (b), CMC milled for 3 h (c) and CMC/ $\text{MgAl}_{200}/\text{K}_2\text{HPO}_4$ (Method 1) (d), CMC/ $\text{MgAl}_{200}/\text{K}_2\text{HPO}_4$ (Method 2) (e), CMC/ $\text{MgAl}_{200}/\text{K}_2\text{HPO}_4$ (Method 3) (f), K_2HPO_4 (g) and B) MgFe (a), CMC (b), CMC milled for 3 h (c), CMC/ $\text{MgFe}_{200}/\text{K}_2\text{HPO}_4$ (Method 1) (d), CMC/ $\text{MgFe}_{200}/\text{K}_2\text{HPO}_4$ (Method 2) (e) and CMC/ $\text{MgFe}_{200}/\text{K}_2\text{HPO}_4$ (Method 3) (f) and K_2HPO_4 (g).

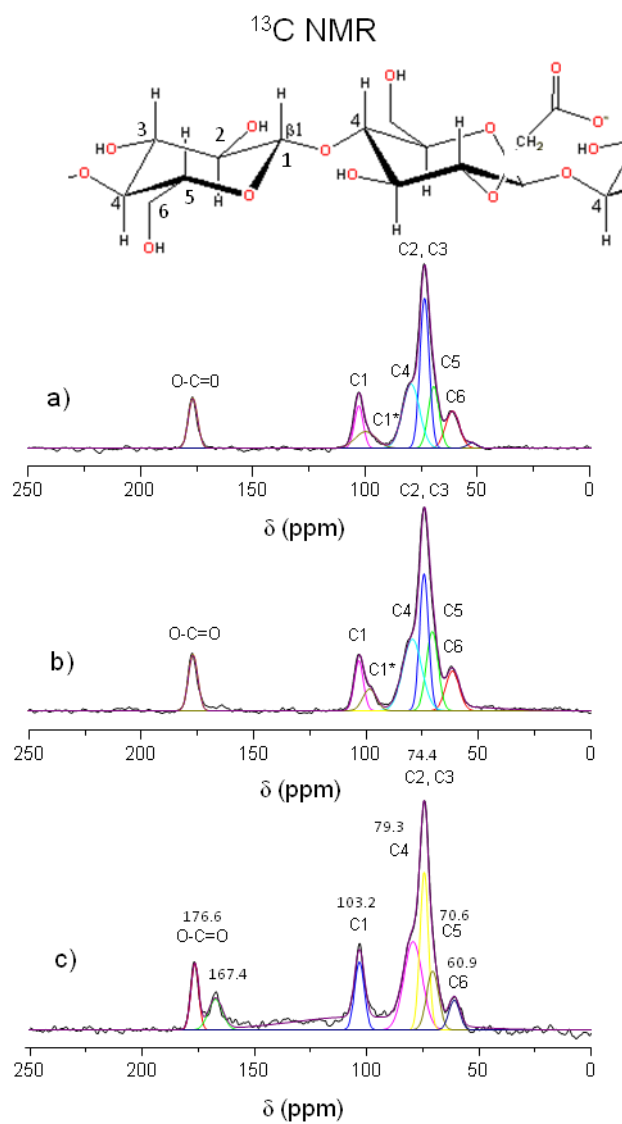


Figure. S4: ^{13}C NMR of CMC (a); CMC milled (b); and CMC/MgAl₂₀₀/K₂HPO₄ (Method 2) (c).

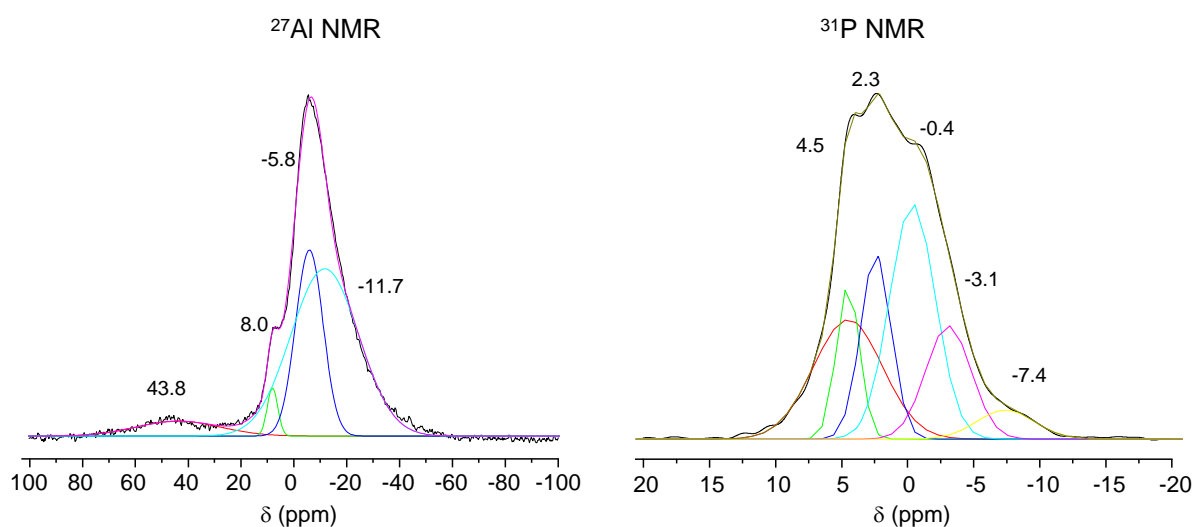


Figure. S5: ^{27}Al and ^{31}P NMR of CMC/MgAl₂₀₀/K₂HPO₄ (Method 2).

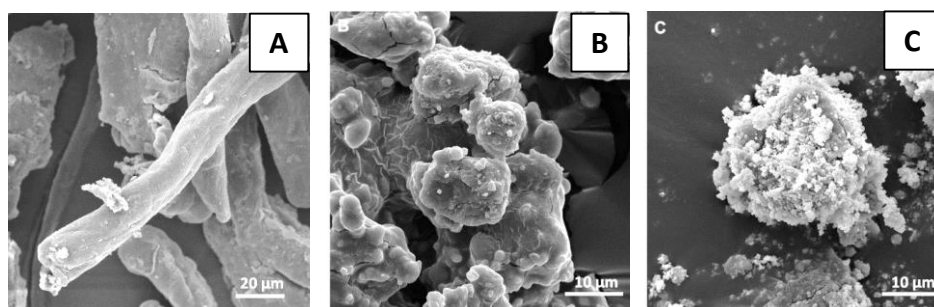


Figure. S6: SEM images of CMC (A), CMC milled with: MgAl₂₀₀/K₂HPO₄ (B), and MgFe₂₀₀/K₂HPO₄ (C).

Table S1: XRD data for struvite-K identified in MgAl₂₀₀/K₂HPO₄.

2θ (°)	d_{hkl} (Å)	hkl
21,06	4,218	111
21,70	4,095	012
26,02	3,424	112
27,50	3,243	103
31,02	2,882	211
32,40	2,763	004
33,38	2,684	022
34,12	2,627	212

Table S2. ^{13}C NMR of CMC, CMC milled, CMC/MgAl₂₀₀/K₂HPO₄ (Method 2).

Site	sample	δ (ppm)	I(%)
C=O	CMC	177.0	10.0
	CMC _{milled}	176.9	10.9
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	176.6	9.7
C1	CMC	103.2	9.9
	CMC _{milled}	103.2	10.8
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	103.2	11.8
C1*	CMC	100.1	23.5
	CMC _{milled}	98.4	15.8
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	-	-
C2-C3	CMC	74.0	10.2
	CMC _{milled}	72.2	10.4
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	74.4	10.4
C4	CMC	80.0	18.9
	CMC _{milled}	79.4	22.2
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	79.3	22.5
C5	CMC	69.9	12.0
	CMC _{milled}	70.6	13.7
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	70.6	14.8
C6	CMC	61.5	15.5
	CMC _{milled}	61.6	16.0
	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	60.9	13.2
C=O*	CMC/MgAl ₂₀₀ /K ₂ HPO ₄	167.4	17.5