

Figure 1 (a-e) SEM micrographs and normalized mass percents (wt.%) of C, O, Fe, Al and Si, as measured by EDX on points 1-5, performed on aggregates (< 2 mm) with no goethite (a) and goethite content of 10 (b), 20 (c), 40 (d) and 80 (e) g kg⁻¹. Red arrows point to phytolith particles, yellow ones to other constituents). (f-j) TEM micrographs performed on aggregates (< 250 μ m) with no goethite (f) and goethite content of 10 (g), 20 (h), 40 (i) and 80 (j) g kg⁻¹. Yellow arrows point to OM and mineral components, red arrows to phytoliths.

(k) Dissolved organic carbon (DOC) extracted using CaCl₂ 0.01M after 16h from both unaggregated mixtures and aggregates for each goethite content (see values in Table S1): different lowercase letter (a, b) resulting from the independent samples *t*-separation test, indicates a significant difference between mixtures and aggregates at a given goethite content ($p < 0.05$); different uppercase letter (A, B, C) resulting from *LSD*'s multiple comparison test, indicates a significant difference among all mixtures or aggregates with various goethite proportion ($p < 0.05$).

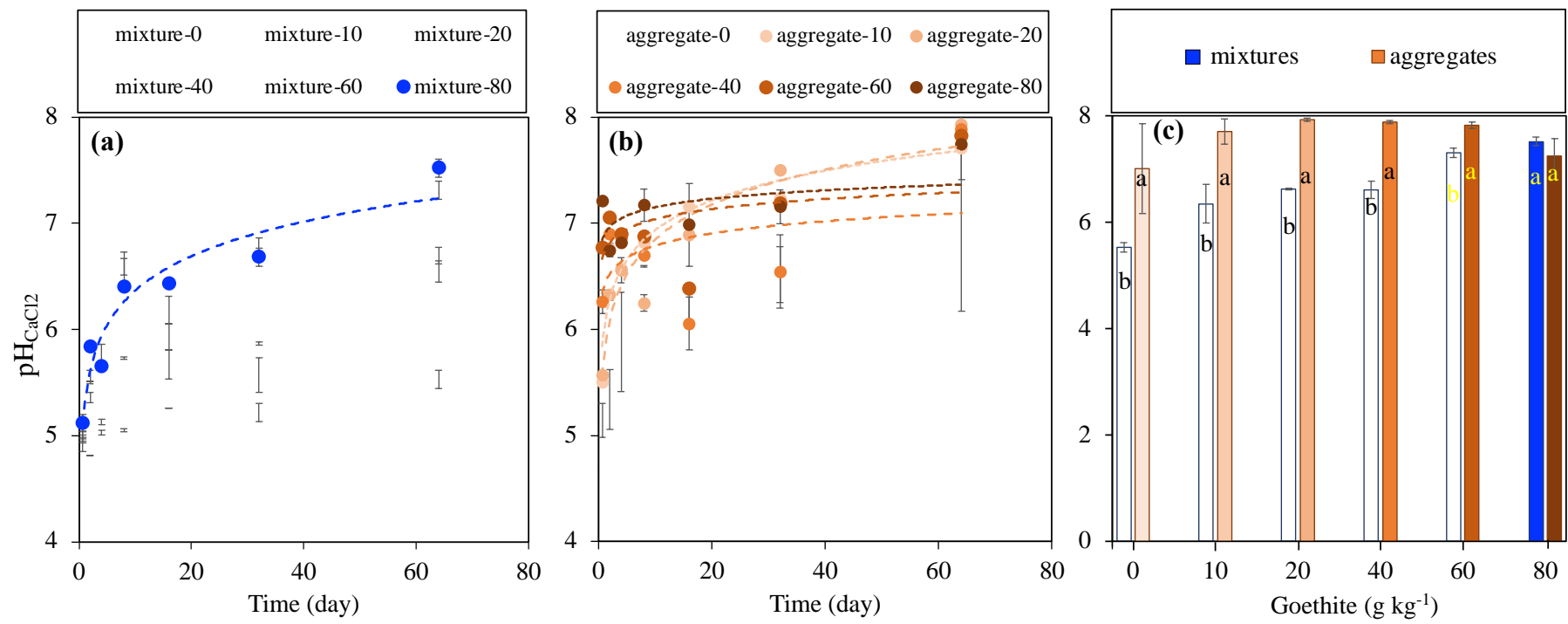


Figure 2. (a-b) Time evolution of pH in 0.01 M CaCl₂ extracts (pH_{CaCl₂}) in unaggregated mixtures (a) and aggregates (b) for each goethite content: the different mixtures and aggregates are designated by their goethite content expressed in g kg⁻¹: mixture-X and aggregate-X where X = 0, 10, 20, 40, 60 or 80 g kg⁻¹.

(c) Values of pH_{CaCl₂} at 64th day: different the lowercase letter (a, b) resulting from the independent samples *t* – separation test ($p < 0.05$) is given for comparison between unaggregated mixtures and aggregates at each goethite content.

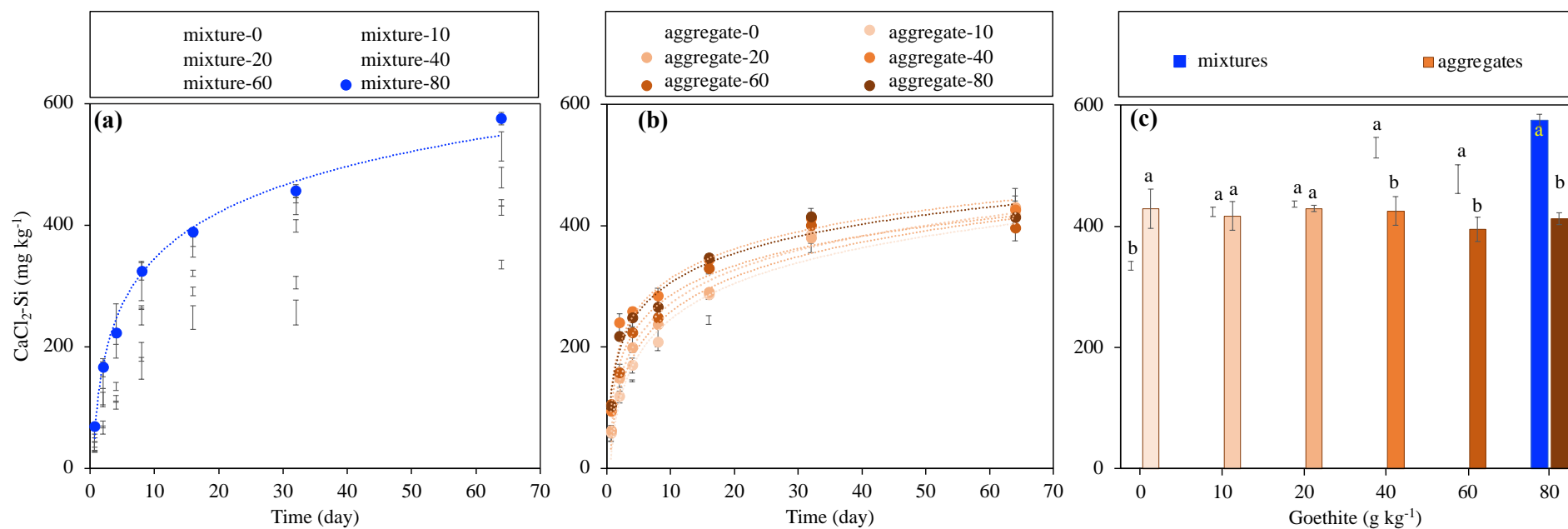


Figure 3. Time evolution of Si in 0.01 M CaCl₂ extracts (CaCl₂-Si) in unaggregated mixtures (a) and aggregates (b) for each goethite content: the different mixtures and aggregates are designated by their goethite content expressed in g kg⁻¹: mixture-X and aggregate-X where X = 0, 10, 20, 40, 60 or 80 g kg⁻¹.
 (c) Values of CaCl₂-Si at 64th day: different the lowercase letter (a, b) resulting from the independent samples *t* – separation test (*p* < 0.05) is given for comparison between unaggregated mixtures and aggregates at each goethite content.
 Note: Time evolution of CaCl₂-Al was illustrated in Fig.S3 in supplementary information.

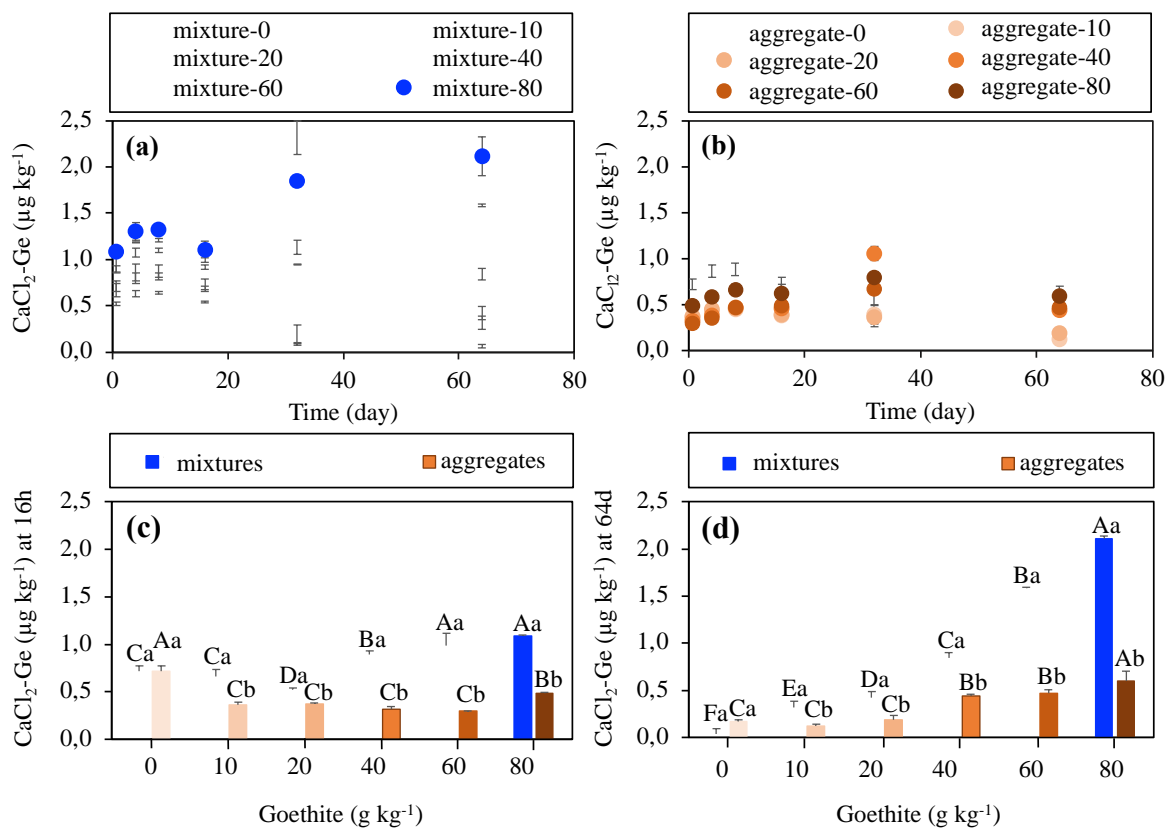


Figure 4. Time evolution of the Ge concentration in 0.01 M CaCl₂ extracts (CaCl₂-Ge) in unaggregated mixtures (a) and aggregates (b) for each goethite content: the different mixtures and aggregates are designated by their goethite content expressed in g kg⁻¹: mixture-X and aggregate-X where X = 0, 10, 20, 40, 60 or 80 g kg⁻¹.

Values of CaCl₂-Ge at 16th hour (c) and 64th day (d): different lowercase letter (a, b) resulting from the independent samples t-separation test, indicates a significant difference between the mixture and the aggregate at a given goethite content ($p < 0.05$); different uppercase letter (A-E) resulting from LSD's multiple comparison test, indicates a significant difference between mixtures and, separately, between aggregates with various goethite content ($p < 0.05$).

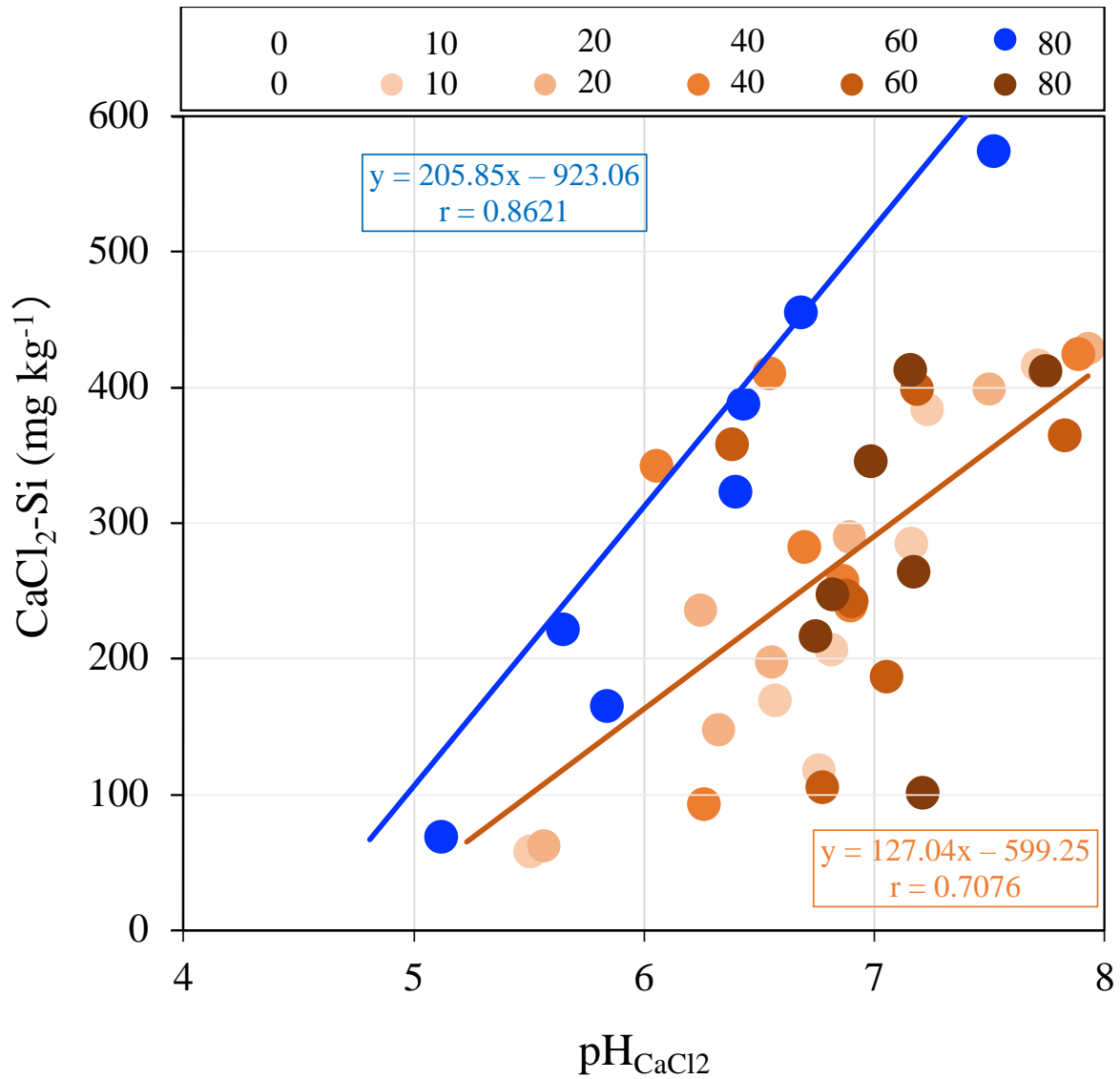


Figure 5. Concentration of Si in CaCl₂ extracts (CaCl₂-Si) as plotted against pH of respective CaCl₂ extracts (pH_{CaCl₂}) in unaggregated mixtures (gradient blue) and aggregates (gradient orange) for each goethite content: the different mixtures and aggregates are designated by their goethite content expressed in g kg⁻¹: mixture-X and aggregate-X where X = 0, 10, 20, 40, 60 or 80 g kg⁻¹. Using the independent samples t-separation test, the values of the slopes of the two regression lines significantly differ at $p < 0.0001$.

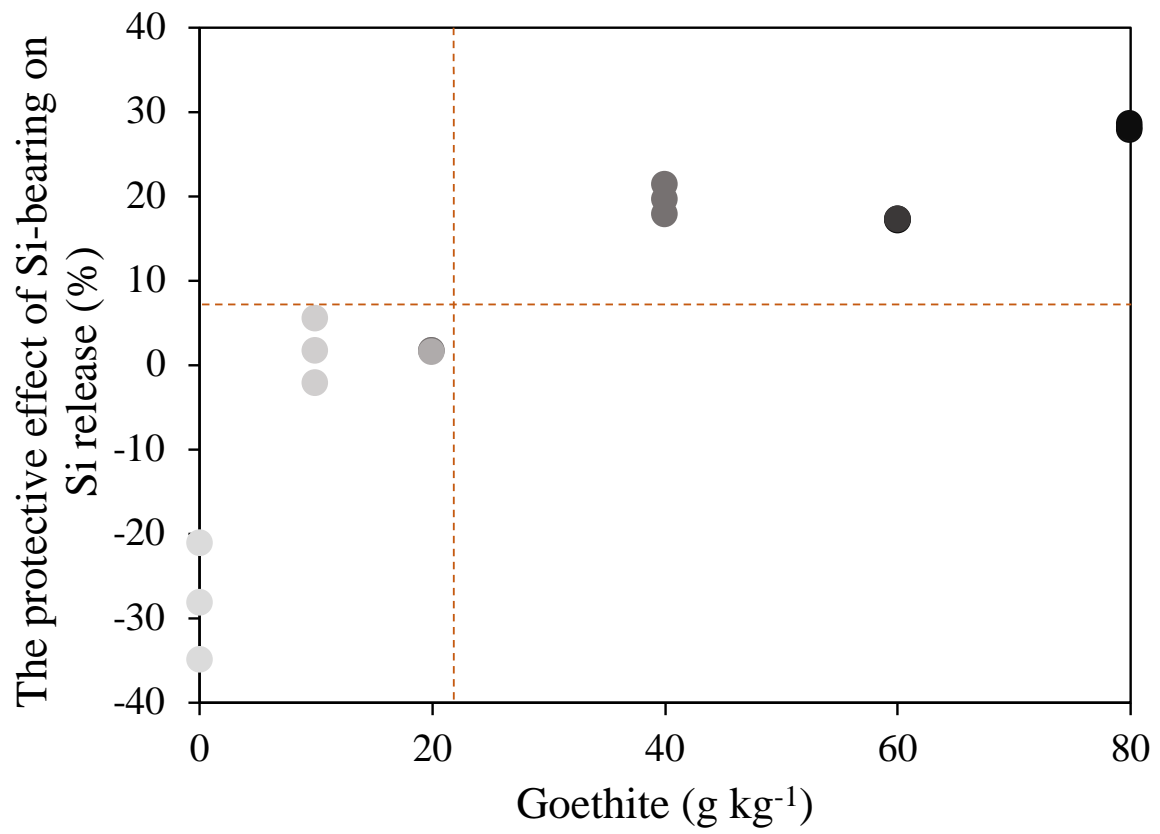


Figure 6. Cate-Nelson plot (Cate and Nelson, 1971) illustrating the protective effect ($PrEf$, Eq [2]) of aggregates on Si release in the goethite-medicated aggregates at the 64th day. The aggregates are designated by their goethite content expressed in 0, 10, 20, 40, 60 or 80 g kg⁻¹.

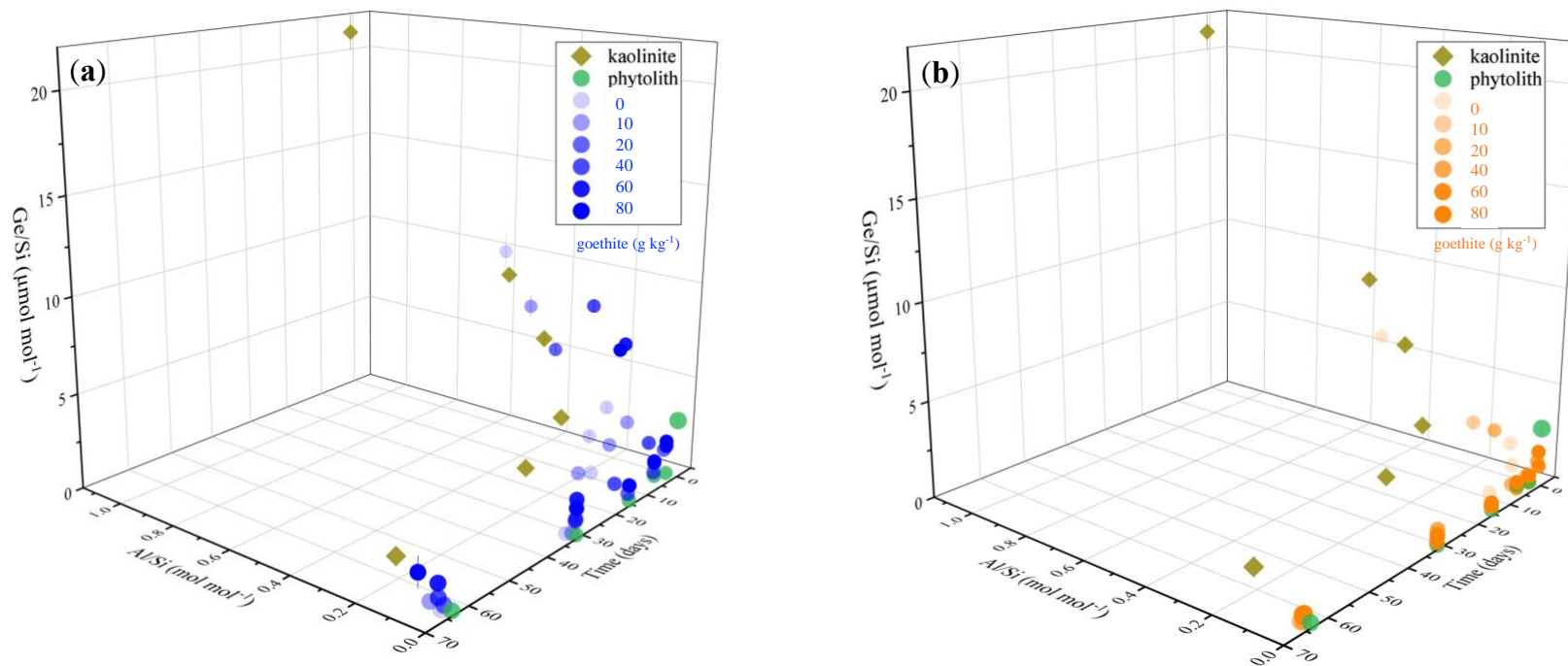


Figure 7. Time evolution of the molar ratios Ge/Si ($\mu\text{mol mol}^{-1}$) and Al/Si (mol mol^{-1}) in 0.01 M CaCl_2 extracts in unaggregated mixtures (a) and aggregates (b) for each goethite content: the different mixtures and aggregates are designated by their goethite content expressed in g kg^{-1} : mixture-X and aggregate-X where X = 0, 10, 20, 40, 60 or 80 g kg^{-1} .

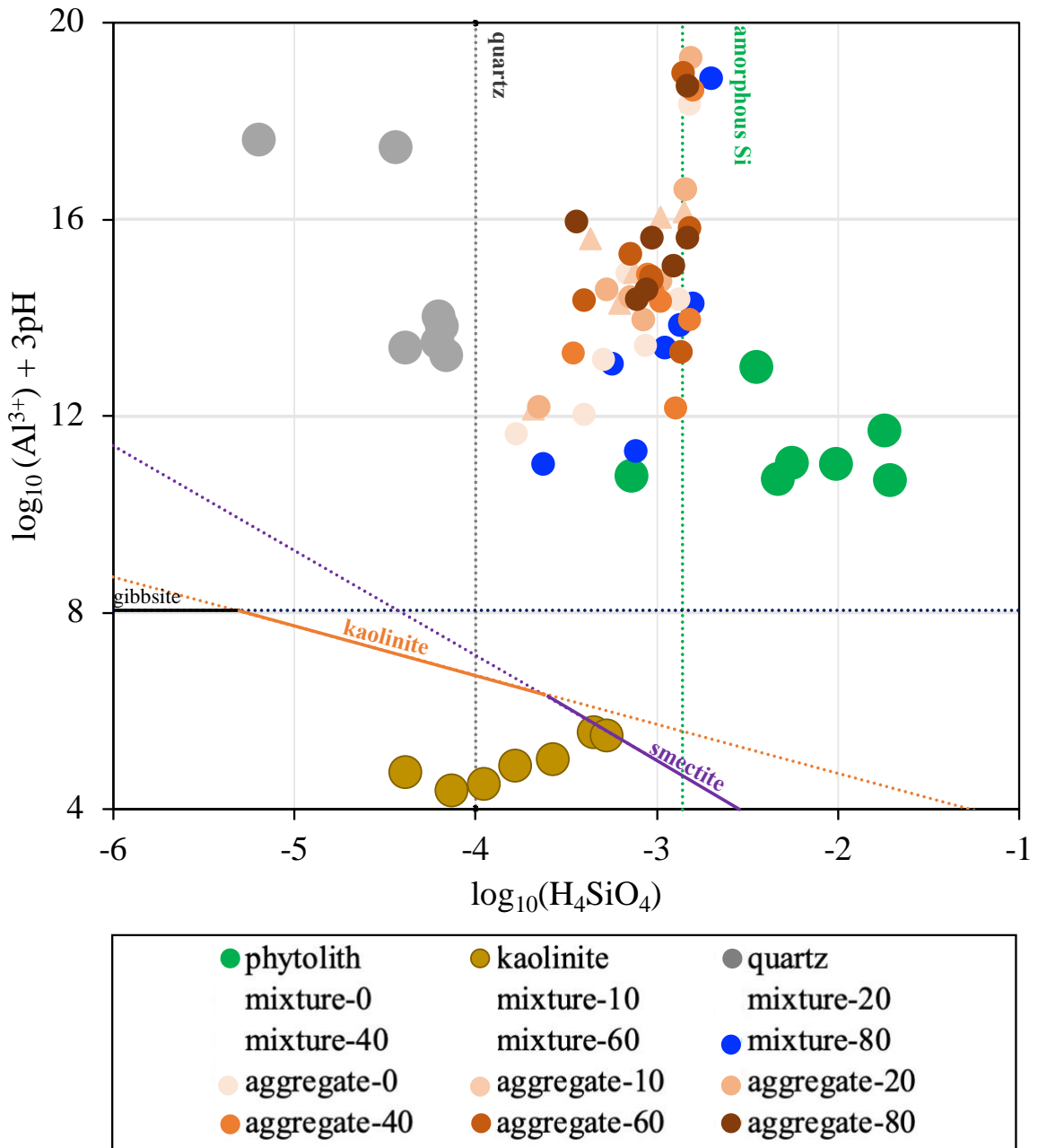


Figure 8. Plot of the logarithmic values of experimental Al^{3+} , H^+ and H_4SiO_4 concentrations (mol l^{-1}) in CaCl_2 extracts at each kinetic step (Table S2) in the stability diagram for reference gibbsite, kaolinite and smectite in the $\text{Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$ system (Lindsay 1979).