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# Insights into cyanobacterial fossilization in Ediacaran siliciclastic environments

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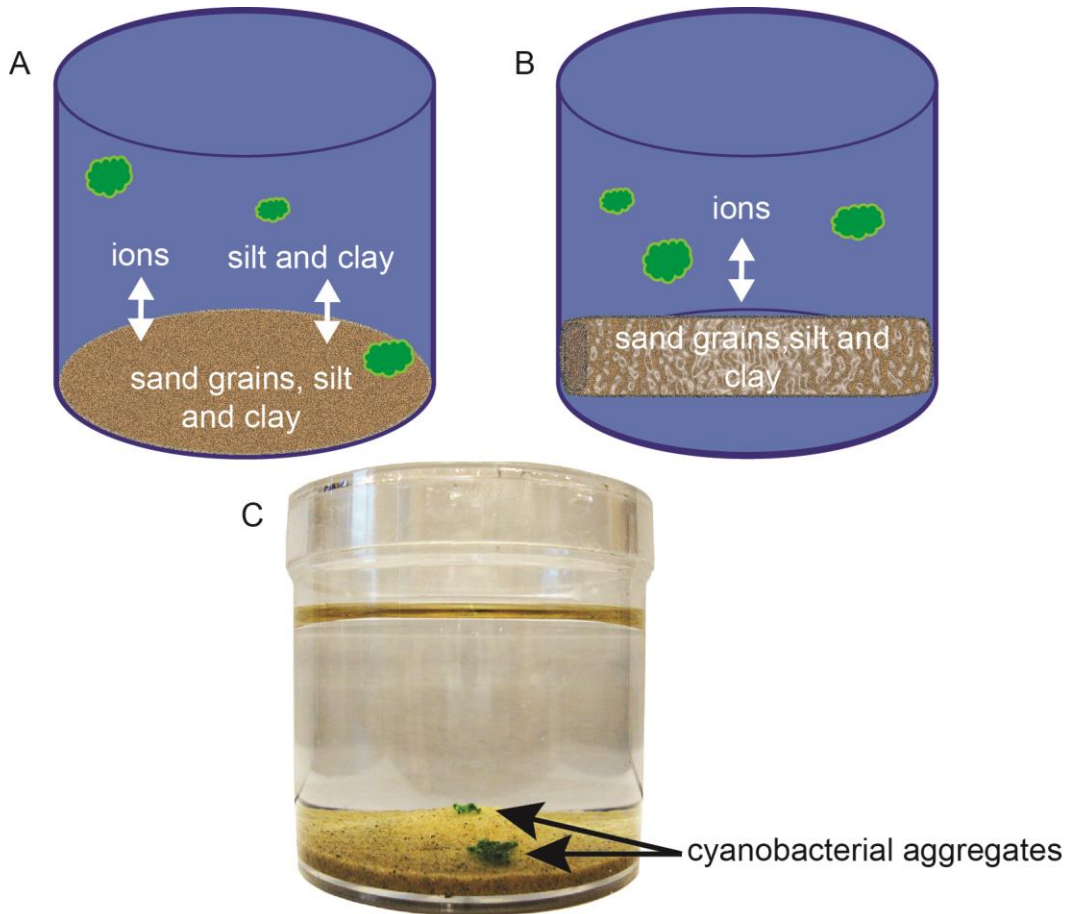


Figure DR1. Schematic of experimental setup. A: Cyanobacterial aggregates growing directly on siliciclastic sand, in the presence of continuous fluid agitation (VWR minishaker, 190 rpm, 3 mm orbital diameter). Ions, silt, and clay can be suspended, but sand grains cannot. B: Cyanobacterial aggregates growing on a dialysis membrane, in the presence of continuous fluid agitation (VWR minishaker, 190 rpm, 3 mm orbital diameter). Ions can pass into solution, but sand grains, silt, and clay are trapped inside the dialysis bag. C: Photograph of cyanobacterial aggregates after two weeks of growth. Culture jars are 68 mm (diameter) x 68 mm (height).

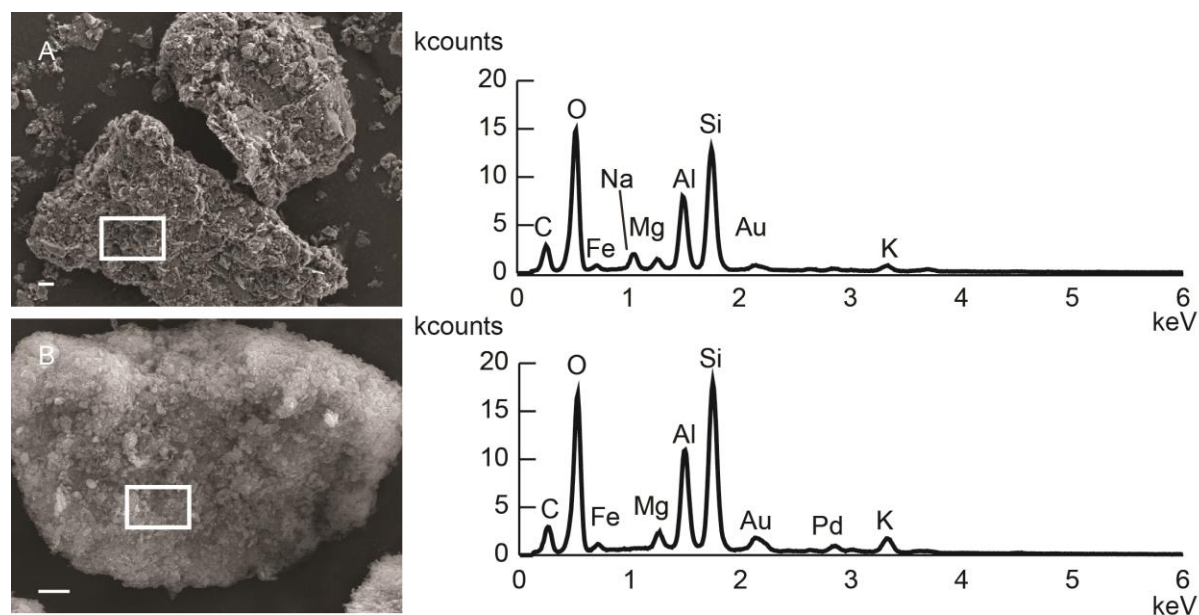


Figure DR2. Representative SEM images and SEM-EDS spectra of sterile substrate. A: Aggregates of clay minerals filtered from the siliciclastic sand and B: aggregates of illite used in suspended sediment experiments. White boxes indicate analyzed areas. EDS spectra are located to the right of corresponding SEM images. Scale bar: 10  $\mu\text{m}$  (A) and 1  $\mu\text{m}$  (B). Samples were Au-Pd sputter coated. See Table DR3 for a quantitative representation of elemental composition.

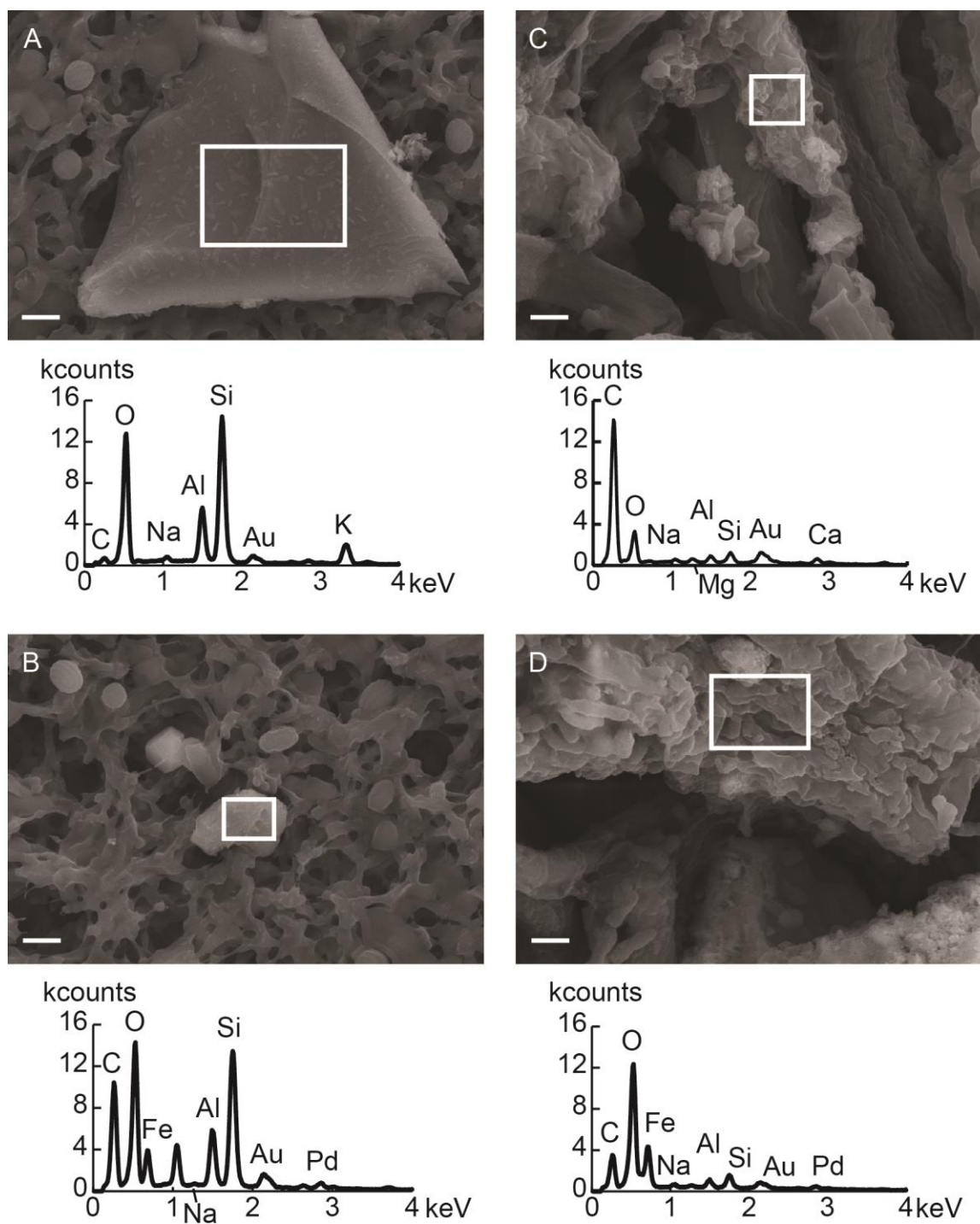


Figure DR3. Representative SEM images and SEM-EDS spectra of A and B: minerals which passed through dialysis bag after less than two months in sterile solutions. The minerals were collected by filtration. C and D: minerals which formed around cyanobacterial filaments in dialysis experiments after one month of cell growth. White boxes indicate analyzed areas. EDS spectra are located beneath corresponding SEM image. Scale bar: 1  $\mu$ m. Samples were Au-Pd sputter coated. See Table DR3 for a quantitative representation of elemental composition.

TABLE DR1. LIST OF INGREDIENTS USED TO MAKE 1 L OF  
ARTIFICIAL SEAWATER.

Ingredient	Amount (g/L)	Volume of stock solution added to 1L of medium (mL)
<u>Nitrate solution</u> <sup>†</sup>		0.5
KNO <sub>3</sub>	5.15	
NaNO <sub>3</sub>	34.45	
<u>Major "10x" solution</u> <sup>†</sup>		10.0
Nitrilotriacetic Acid	1.00	
NaCl	4.82	
NaH <sub>2</sub> PO <sub>4</sub>	0.09	
KCl	0.74	
<u>Cast D Trace</u> <sup>†</sup>		1.0
MnCl <sub>3</sub> *4H <sub>2</sub> O	2.67	
ZnSO <sub>4</sub> *7H <sub>2</sub> O	0.50	
CuSO <sub>4</sub> *5H <sub>2</sub> O	0.03	
Na <sub>2</sub> MoO <sub>4</sub>	0.02	
Co(NO <sub>3</sub> ) <sub>2</sub> *6H <sub>2</sub> O	0.06	
H <sub>3</sub> BO <sub>3</sub>	0.50	
H <sub>2</sub> SO <sub>4</sub> (concentrated)	0.50	
NiCl <sub>2</sub>	0.48*10 <sup>-4</sup>	
<u>FeCl<sub>3</sub></u> <sup>†</sup>	3.00	0.1
<u>Mg/Ca solution (5:1)</u> <sup>†</sup>		50.0
CaCl <sub>2</sub> *2H <sub>2</sub> O	29.40	
MgCl <sub>2</sub> *6H <sub>2</sub> O	203.30	
Sodium silicate solution <sup>†,§</sup>	≤0.09	
NaCl <sup>†</sup>	23.0	
Na <sub>2</sub> SO <sub>4</sub> <sup>†</sup>	0.71	
KCl <sup>†</sup>	1.48	
NaHCO <sub>3</sub> <sup>†</sup>	0.34	

*Note:* Underlined ingredients denote stock solutions. The individual components of each stock solution are given (in g/L). The volume of stock solution (in mL) added to 1L of the basal medium is also given.

<sup>†</sup>Ingredient was added directly to 1L of basal medium.

<sup>§</sup>Reagent grade sodium silicate solution (Na<sub>2</sub>O(SiO<sub>2</sub>)<sub>x</sub> · xH<sub>2</sub>O) was purchased from Sigma-Aldrich (St. Louis, MO).

TABLE DR2. LIST OF EXPERIMENTAL CONDITIONS

Substrate	Clay (mg/L)	Silica concentration (mM)	Dialysis membranes
Siliciclastic sand	0.03*	0.0	no
Siliciclastic sand	0.03*	0.4	no
None	0.0	0.0	no
None	0.0	0.1	no
Illite	5.6	0.0	no
Illite	5.6	0.1	no
Illite	55.6	0.0	no
Illite	55.6	0.1	no
Siliciclastic sand	0.03*	0.4	yes

*Note:* Siliciclastic sand was purchased from the Ottawa Silica Co. (Ottawa, IL) and contained quartz, mica, and clay minerals. Illite powder was purchased from Time Laboratories (Pocatello, ID) and was 100% clay fraction.

\*Given as weight percent of siliciclastic sand.

TABLE DR3. ELEMENT COMPOSITION DATA FOR EDS SPECTRA (GIVEN AS WEIGHT PERCENT, Wt%, AND ATOMIC PERCENT, At%)

	Figure 1A		Figure 1B		Figure 1C		Figure DR2A		Figure DR2B		Figure DR3A		Figure DR3B		Figure DR3C		Figure DR3D	
<u>Element</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>	<u>Wt%</u>	<u>At%</u>
CK	49.5	72.4	13.9	24.0	3.5	8.1	10.0	18.5	3.3	7.1	2.1	4.3	22.5	37.9	45.2	71.1	30.5	61.1
NK	5.3	6.6	4.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OK	13.7	15.1	35.6	46.2	23.7	41.4	28.1	38.9	23.0	37.1	28.1	43.8	21.1	26.6	14.7	17.4	13.6	20.5
FeL	2.1	0.7	0.0	0.0	6.6	3.3	4.5	1.8	3.7	1.7	0.4	0.5	5.5	5.9	0.8	0.8	16.4	7.1
NaK	0.6	0.5	0.7	0.6	0.2	0.2	2.6	2.5	0.1	0.1	0.7	0.8	5.0	4.4	1.0	0.8	0.7	0.8
MgK	0.1	0.0	1.0	0.8	2.0	2.3	1.7	1.5	2.5	2.6	0.0	0.0	0.2	0.2	1.2	0.9	0.6	0.6
AlK	0.6	0.4	9.4	7.2	12.2	12.6	13.6	11.2	14.9	14.2	10.6	9.8	8.0	6.0	2.2	1.6	0.5	0.5
SiK	0.3	0.2	10.8	8.0	24.4	24.3	27.4	21.6	32.1	29.4	34.4	30.5	23.1	16.6	4.0	2.7	2.2	1.8
PK	0.4	0.3	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AuM	17.0	1.5	8.1	0.9	15.0	2.1	4.6	0.5	7.5	1.0	6.9	0.9	9.3	1.0	18.4	1.8	19.9	2.4
SK	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ClK	0.7	0.4	0.0	0.0	0.0	0.0	0.5	0.3	0.2	0.1	0.6	0.4	0.6	0.3	0.1	0.1	0.3	0.2
PdL	8.3	1.4	3.9	0.8	7.2	1.9	2.3	0.5	3.8	0.9	3.3	0.8	3.8	0.7	8.9	1.6	9.8	2.2
KK	0.0	0.0	1.1	0.6	4.5	3.2	3.2	1.8	7.3	4.8	13.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0
CaK	1.2	0.5	1.4	0.7	0.8	0.6	1.6	0.9	1.7	1.1	0.0	0.0	0.9	0.4	1.9	0.9	2.2	1.3
MnK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.6	3.3	1.4
FeK	0.0	0.0	9.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Note:* Element composition data for EDS are presented with corresponding figure or data repository figure numbers. ZAF matrix corrections were used to obtain quantitative results. Due to the irregular topography of our samples and the large abundance of carbon, the figures in the main manuscript focus on the presence/absence of elemental peaks.