Electronic Supplementary Information

Mimic biomineralization matrix using bacterial cellulose hydrogel and egg white to prepare various morphologies of $CaCO_3$

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EXPERIMENTAL SECTION

During mineralization for this study, the initial concentrations were 0.2 mol/L for $CaCl_2$ and $NaCO_3$. The concentration of egg white varied from 0% to 100%. The reaction solutions were replaced every 12 hours to keep the concentration of Ca^{2+} and CO_3^{2-} constant. The mineralization time was fixed at 7 days. After formation, the mineral was extracted, washed with ultra-pure water, and then dried.

COMPONENT ANALYSIS

In order to confirm the composition of the mineralized particles, FT-IR was used to characterize the samples, and the results for three representative samples prepared at egg-white concentrations of 0%, 30%, and 80%, respectively, appear in Figure S1. In the FT-IR spectra, the peaks at 1409 cm^{-1}, 873 cm^{-1} and 710 cm^{-1} respectively indicate the asymmetry stretching vibration, out-of-plane bending, and in-plane bending of CO_3^{2-}. These are the characteristic absorption peaks of $CaCO_3$. The peak at 3347 cm^{-1} is the stretching vibration absorption spectrum of the O-H that is part of the carbohydrate chain of the BC. The weak absorption peaks of the C-NH_2 stretching vibration (1111 cm^{-1}) and NH_2^+ bending vibration (1648 cm^{-1}) indicate the presence of EWP. Therefore, the main component of all the samples is $CaCO_3$. The sample prepared at an egg-white concentration 0% (Curve a) contains a certain amount of BC, and no EWP peaks are found, which is in agreement with the experiment. The sample prepared at 80% egg-white concentration (Curve c) has weak EWP peaks, indicating the presence of EWP in the mineral. However, the sample also has an absorption peak at 3347 cm^{-1}, disagreeing with the results of the SEM test. In view of the weak intensity, we think it is not caused by BC, but by a small amount of adsorbed water on the surface of the mineral. As for the sample prepared at an egg-white concentration of 30% (Curve b), it contains both BC and EWP.

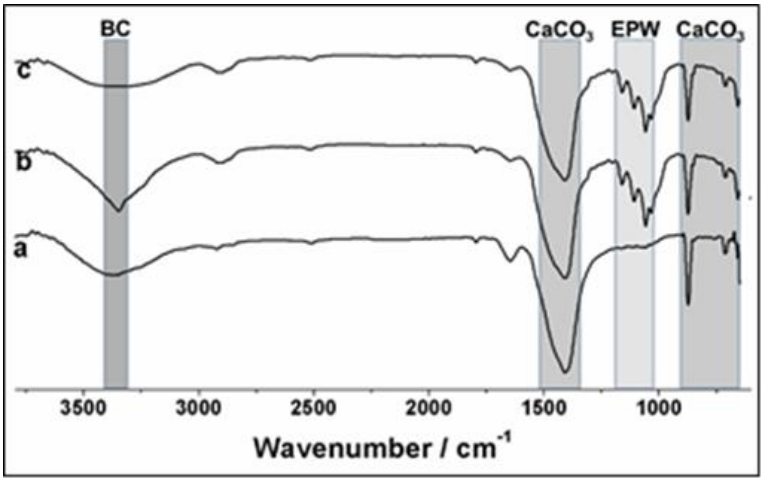

Figure S1. FT-IR spectra of the sample mineralized at egg-white concentrations of 0% (pure water, Curve a), 30% (Curve b) and 80% (Curve c).

DETAILED SEM CHARACTERIZATION

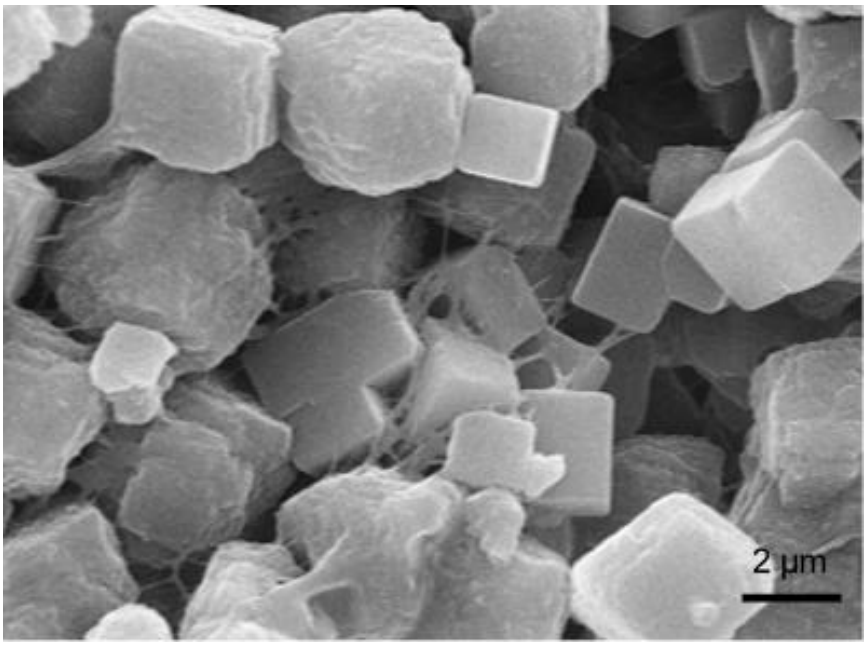

Figure S2. Enlarged SEM image of the sample mineralized at an egg-white concentration of 0%

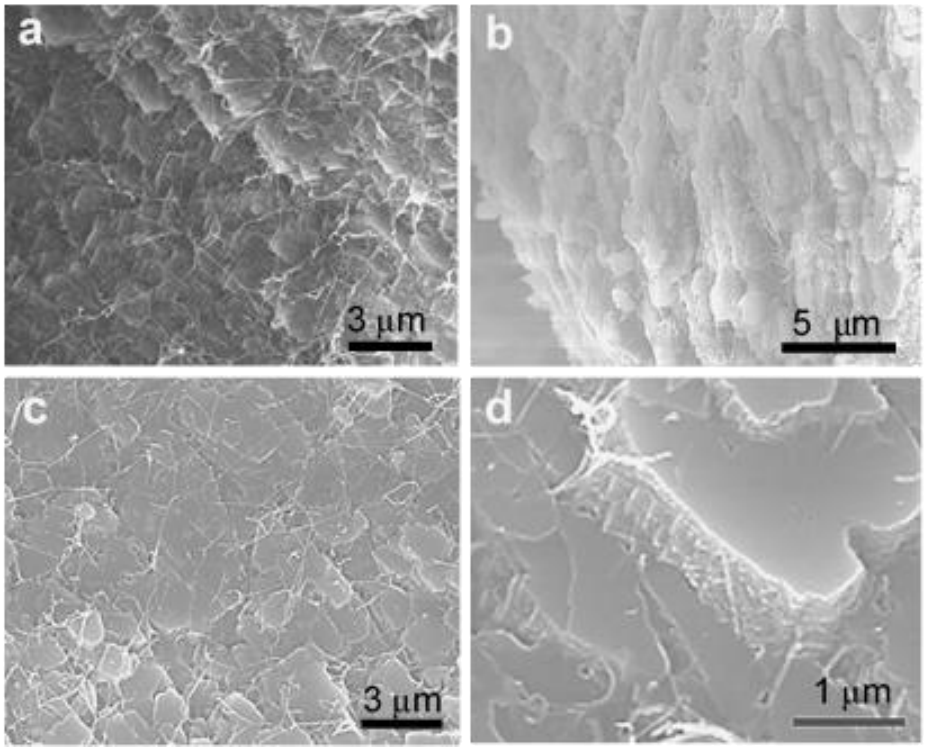

Figure S3. Lateral surfaces of the sample mineralized at an egg-white concentration of 30% (a) and 50% (b), as well as the face of the sample mineralized at an egg-white concentration of 30% (c, d).

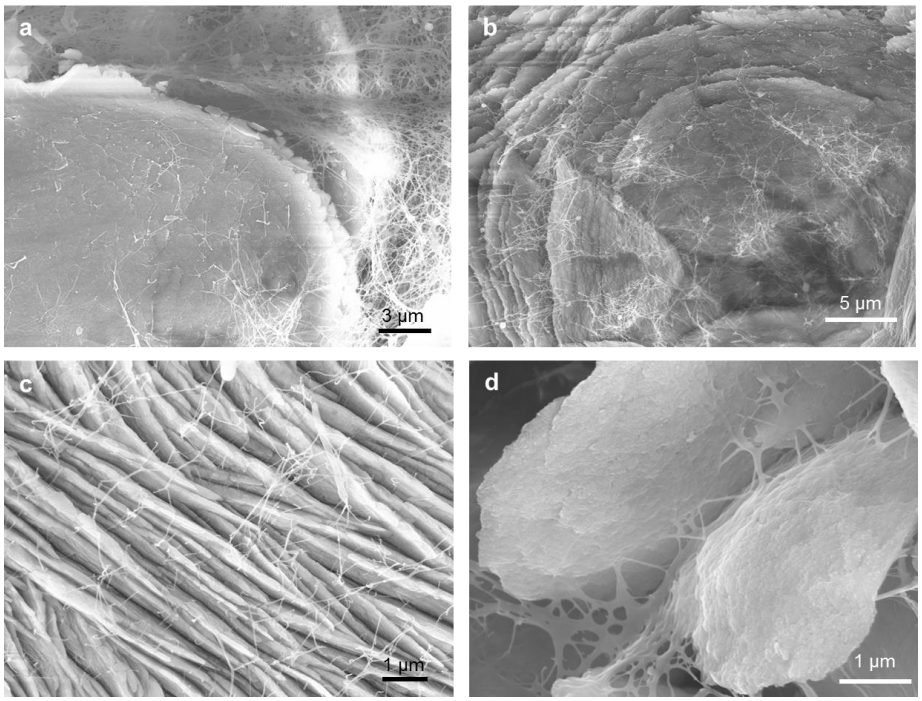

Figure S4. Enlarged SEM image of the sample mineralized at different egg-white concentrations: a, 5%; b, 10%; c, 15%; d, 20%.

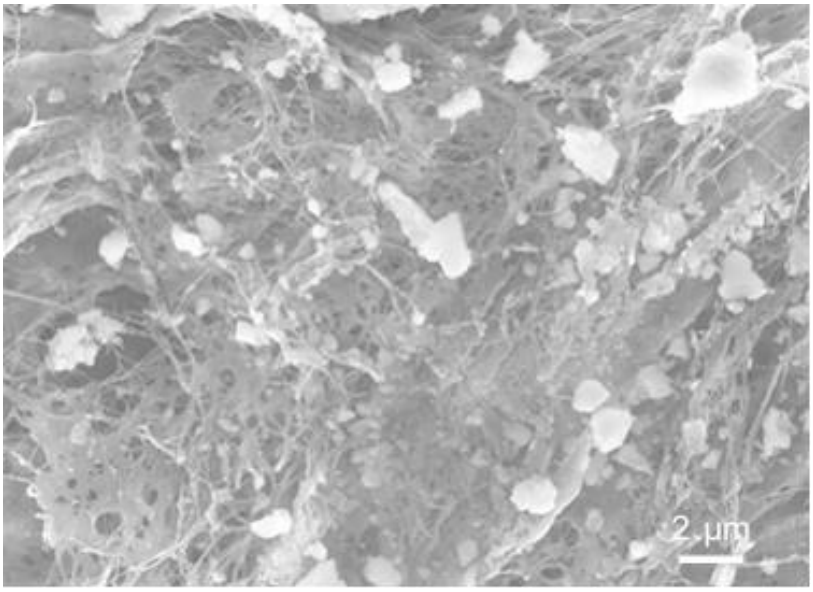

Figure S5. SEM images of the samples mineralized at the egg-white concentrations of 60% (the inner ends of the BCH).

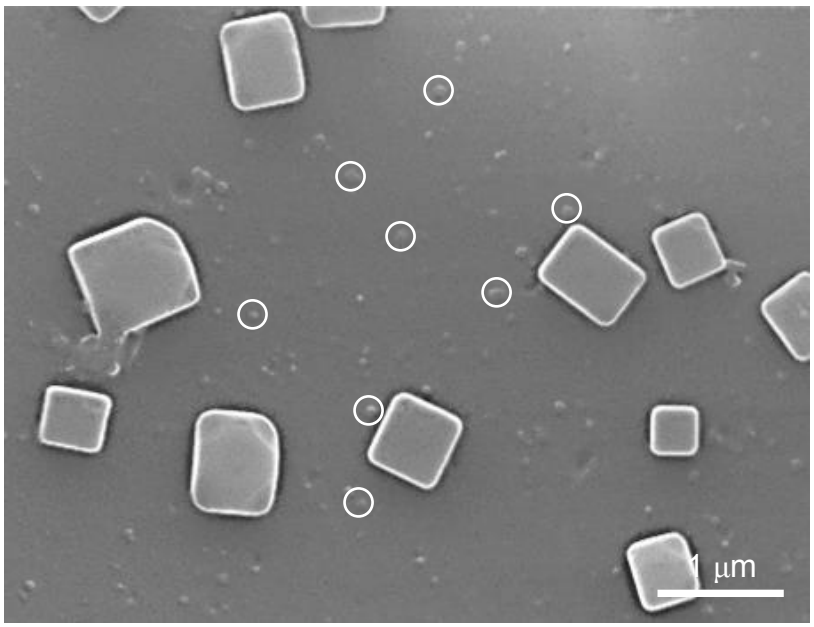

Figure S6. Enlarged SEM image of the sample mineralized at egg-white concentration of 80% (white circles indicate small undeveloped papillae).