Supporting Information:

One-step synthesis of calcium sulfate hemihydrate nanofibers from calcite at room temperature

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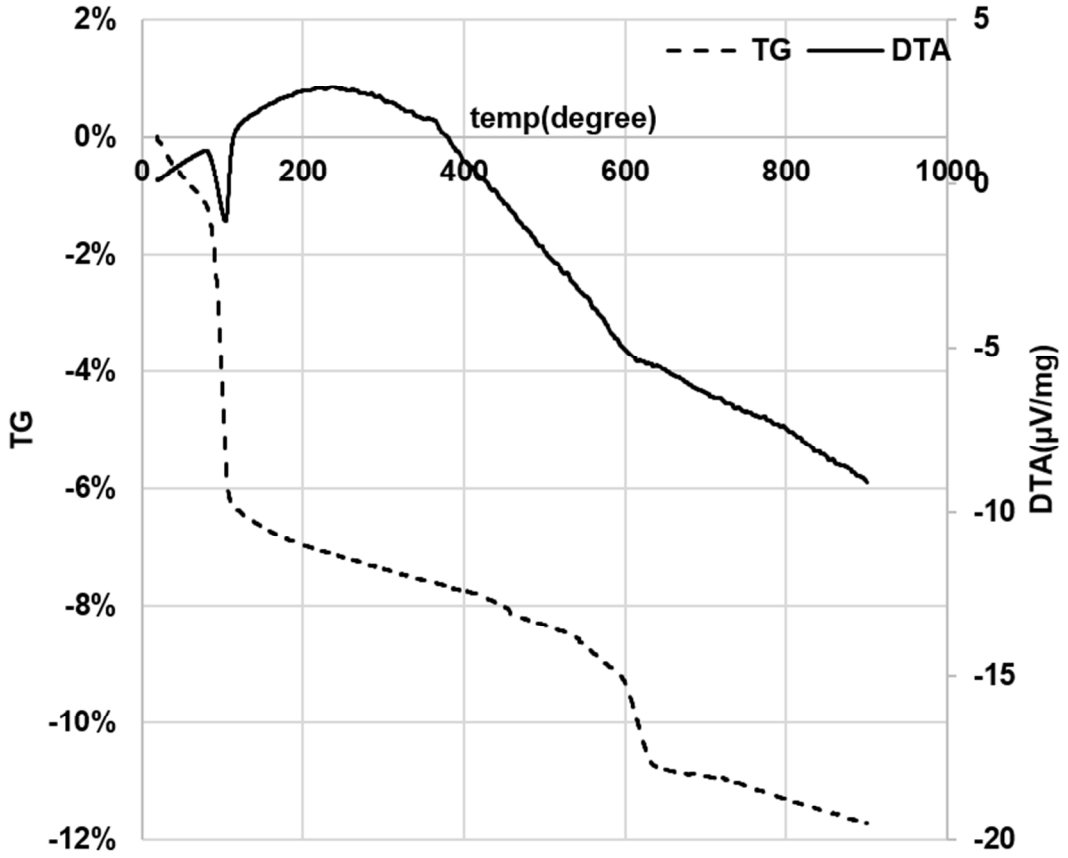

Figure S1.

Thermal analysis data to examine bassanite and calcite contents of the M-425. The weight loss due to the dehydration (at around 100 °C) of pure bassanite is calculated as 6.2 % and that for the M-425 estimated from the dotted line (thermalgravimetry; TG) is 5.8 %, indicating the content of bassanite in the M-425 is 93%. The weight loss due to the decarboxylation of calcite (at around 600-700 °C) of pure calcite is calculated as 44% and that for the M-425 estimated from the dotted line (TG) is 3.1%, indicating the content of bassanite in the M-425 is 7.2%. The thermogravimetry and differential thermal analysis (TG/DTA) was performed from room temperature to 900 °C at a heating rate of 10 °C/min in an air flow of 100 cm^3/min.

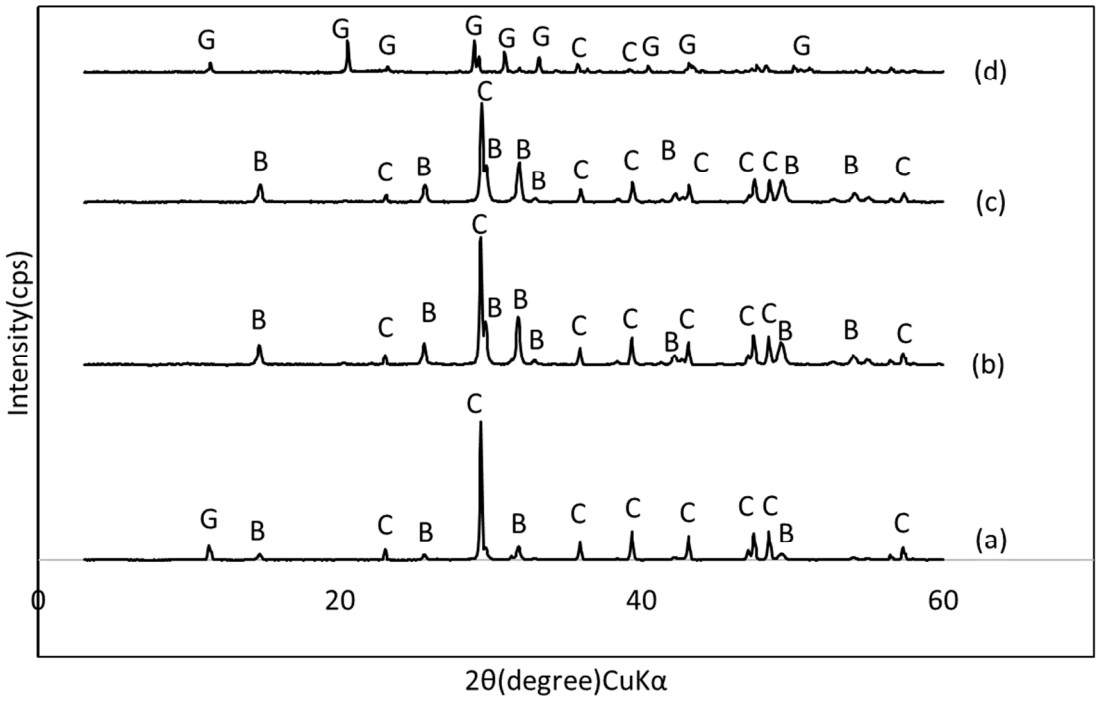

Figure S2

Mineralogical changes without stirring in methanol (a–c), and in water (d). a) M'-5: Weak XRD peaks of bassanite observed at a reaction time of 5 min. A small unknown peak is observed at 11.4°. b) M'-95: The increased bassanite peaks at 95 min. c) M'-425: Almost the same pattern as that at 95 min observed at 425 min. d) W-425: The formation of gypsum with water as a solvent. C: calcite; B: bassanite; G: gypsum.

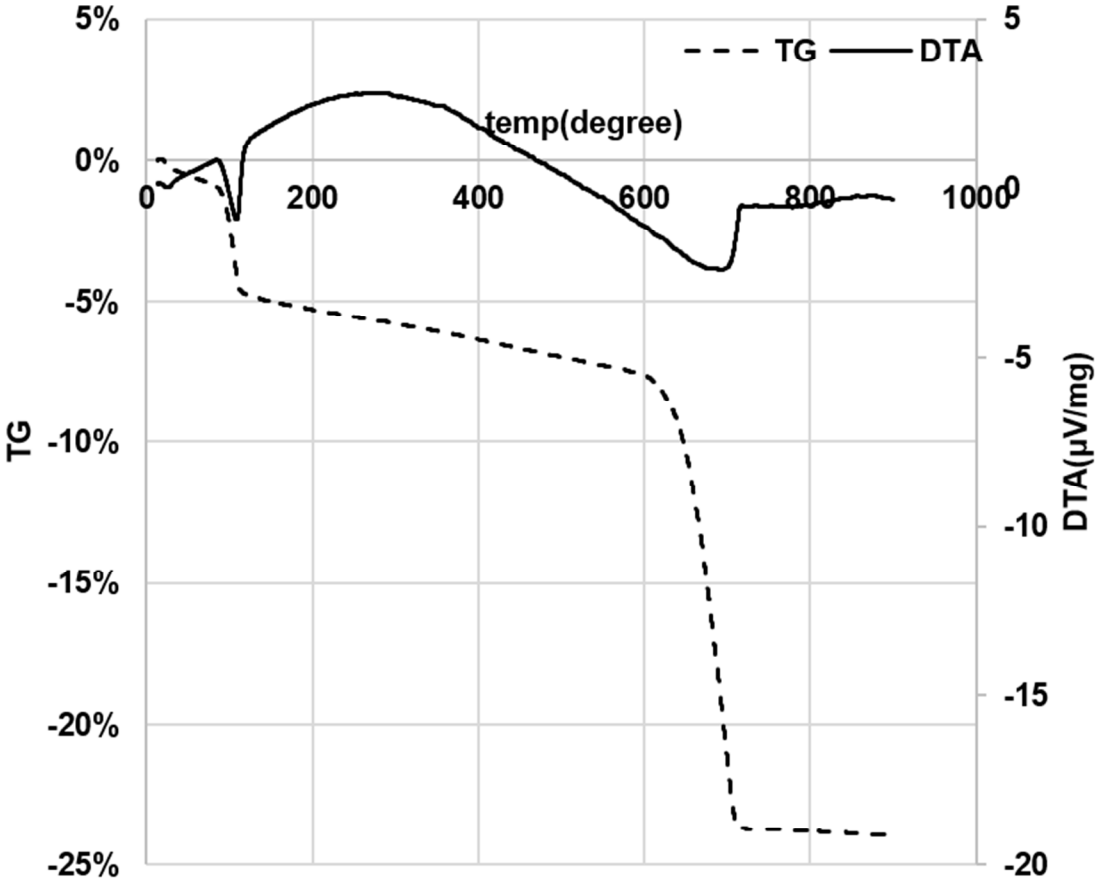

Figure S3

Thermal analysis data to examine bassanite and calcite contents of the M'-425. The weight loss due to the dehydration (at around 100 °C) of pure bassanite is calculated as 6.2% and that for the M'-425 estimated from the dotted line (thermalgravimetry; TG) is 4.0%, indicating that the content of bassanite in the M'-425 is 64%. The weight loss due to the decarboxylation of calcite (at around 600-700 °C) is calculated as 44% and that for the M'-425 estimated from the dotted line (TG) is 16%, indicating the content of bassanite in the M'-425 is 37%. The thermogravimetry and differential thermal analysis (TG/DTA) was performed from room temperature to 900 °C at a heating rate of 10 °C/min in an air flow of 100 cm^3/min.

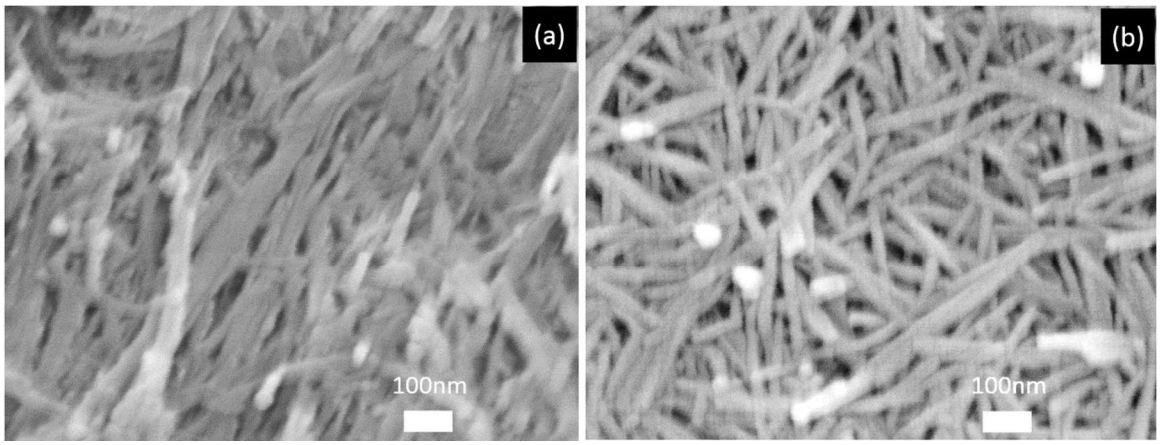

Figure S4

SEM images of bassanite nanofibers obtained by adding 10 M sulfuric acid to calcite in methanol at a reaction time of 425 min. a) with stirring b) without stirring. The nanofibers in the figures are identified as bassanite by XRD analysis. The figures show that even though the amount of water contained in the sulfuric acid solution was reduced, bassanite nanofibers were synthesized, indicating that the water in bassanite nanofibers is derived from the water generated from the neutralization of calcite and sulfuric acid.

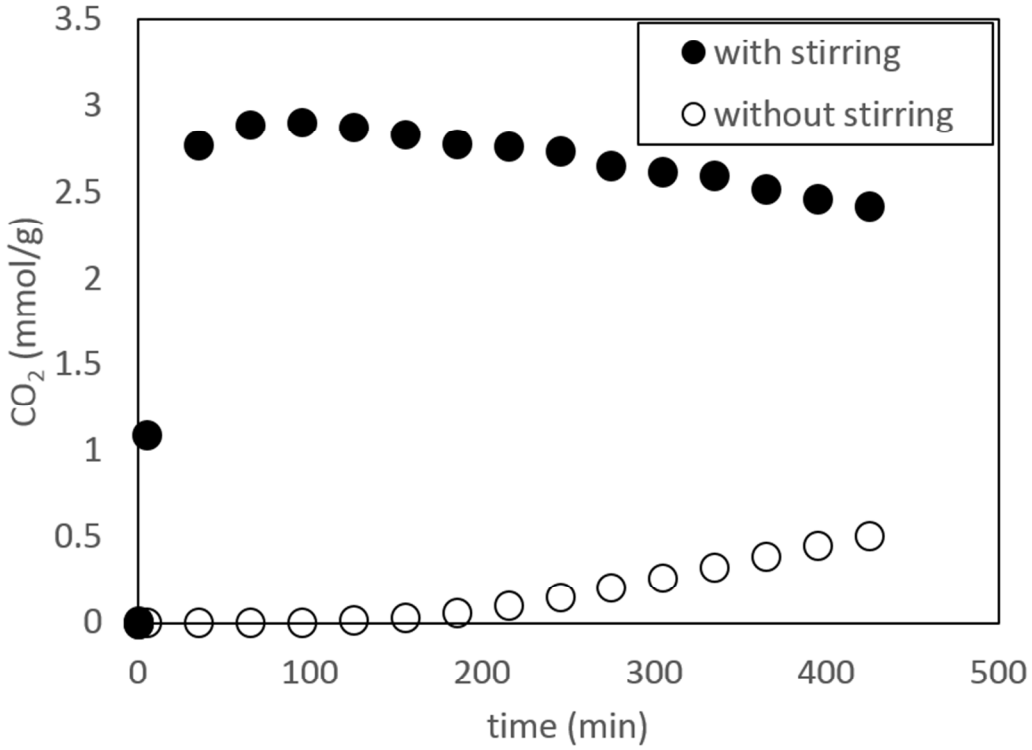

Figure S5

The amount of CO_2 released in the reaction of calcite and dilute sulfuric acid in methanol with and without stirring. Without stirring (open circles), the CO_2 generated by the neutralization reaction of calcite and sulfuric acid was not observed in the bulk solution until the reaction time of 95 min, and after that a slight increase was observed. Because the formation of bassanite after 5 and 95 min was confirmed by XRD analysis (Figs. S2a and c), generated CO_2 was assumed to be retained near the surface of calcite particles. In contrast, rapid release of CO_2 was observed with stirring (closed circles), indicating that the above assumption was correct. The measurement of CO_2 was performed by taking samples of gas from the chamber and subsequent determination of CO_2 concentration by a gas chromatograph (GLScience; GC-390A) equipped with a methanizer.