Supporting Information

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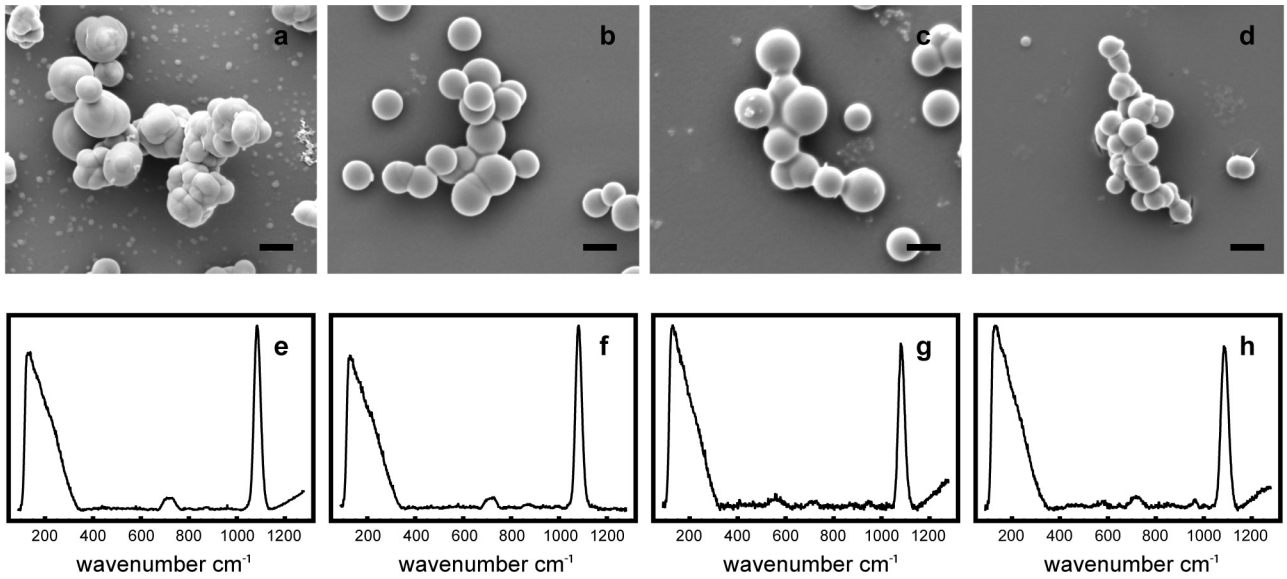

Fig. S1. SEM images of particles produced from solutions with a Mg/Ca ratio of 4.0 with no impurities (*A*), 0.025 M aspartic acid (*B*), 0.025 M glutamic acid (*C*), and 0.025 M oxydiacetic acid (*D*). (Scale bars, 1 μm.) Particles have smooth and spherical morphologies indicative of amorphous carbonates. These samples were prepared by precipitation onto glass slides and coated with 8-nm Pd–Au and then imaged by using a FEI Quanta field emission scanning electron microscope, operated at 5 kV. Raman spectra of particles produced from solutions with a Mg/Ca ratio of 4.0 that contained no impurities (*E*), 0.025 M aspartic acid (*F*), 0.025 M glutamic acid (*G*), and 0.025 M oxydiacetic acid (*H*). All of the spectra show peak broadening of v1 ($\approx$1085 cm^{-1}) and v4 ($\approx$714 cm^{-1}) and the absence of lattice modes at ($\approx$155 cm^{-1}) and ($\approx$270 cm^{-1}) that is characteristic of amorphous carbonates. Spectra were collected on a JY Horiba LabRam HR equipped with a 632-nm HeNe laser using an Olympus 100$\times$ objective (N.A. = 0.9). Collection times of 300 s were used.

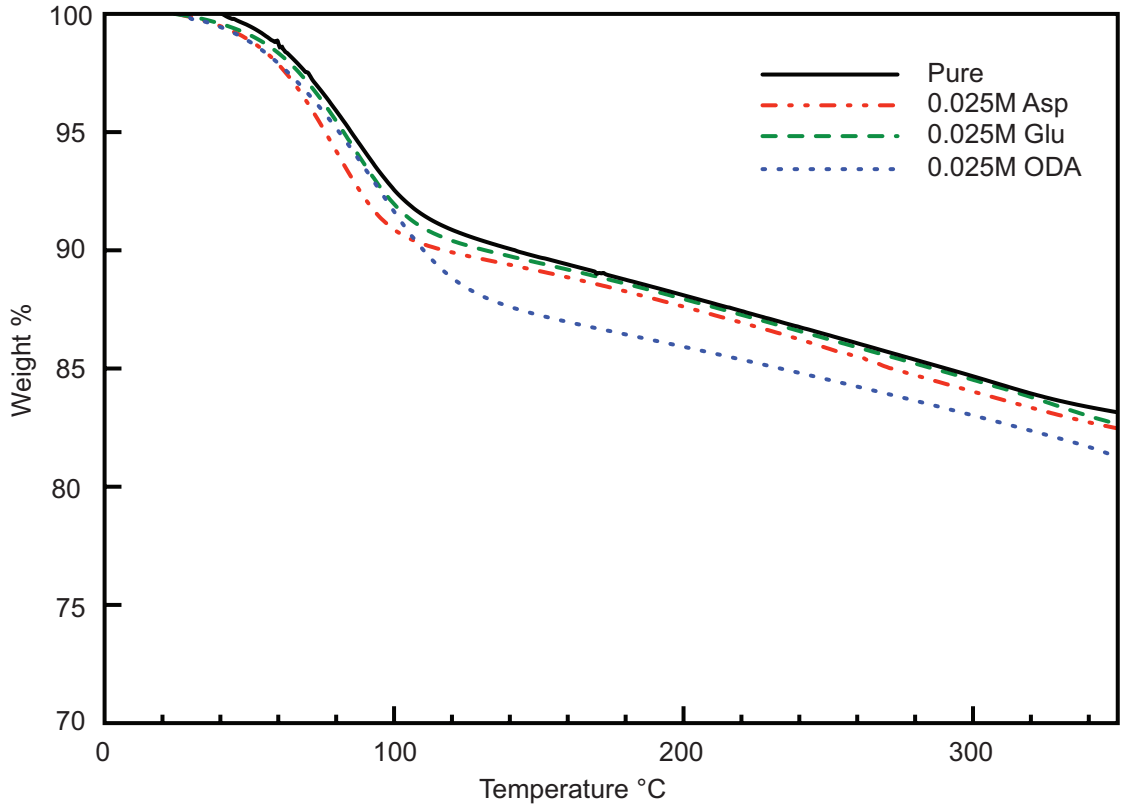

Fig. S2. Thermogravimetric analysis performed on a TA-TGA 2950 of particles filtered from solutions with a Mg/Ca ratio of 4.0, washed in ethanol, and dried under vacuum overnight. The amorphous calcium carbonate prepared in solutions without impurities (Pure), 0.025 M aspartic acid (Asp), and 0.025 M glutamic (Glu) yielded particles with ≈14% weight loss between room temperature and 250 °C. In solutions with 0.025 M oxydiacetic acid (ODA) particles show an ≈15.5% weight loss between room temperature and 250 °C. The data demonstrate a stoichiometry of approximately one water molecule per calcium carbonate.