Supplementary Materials

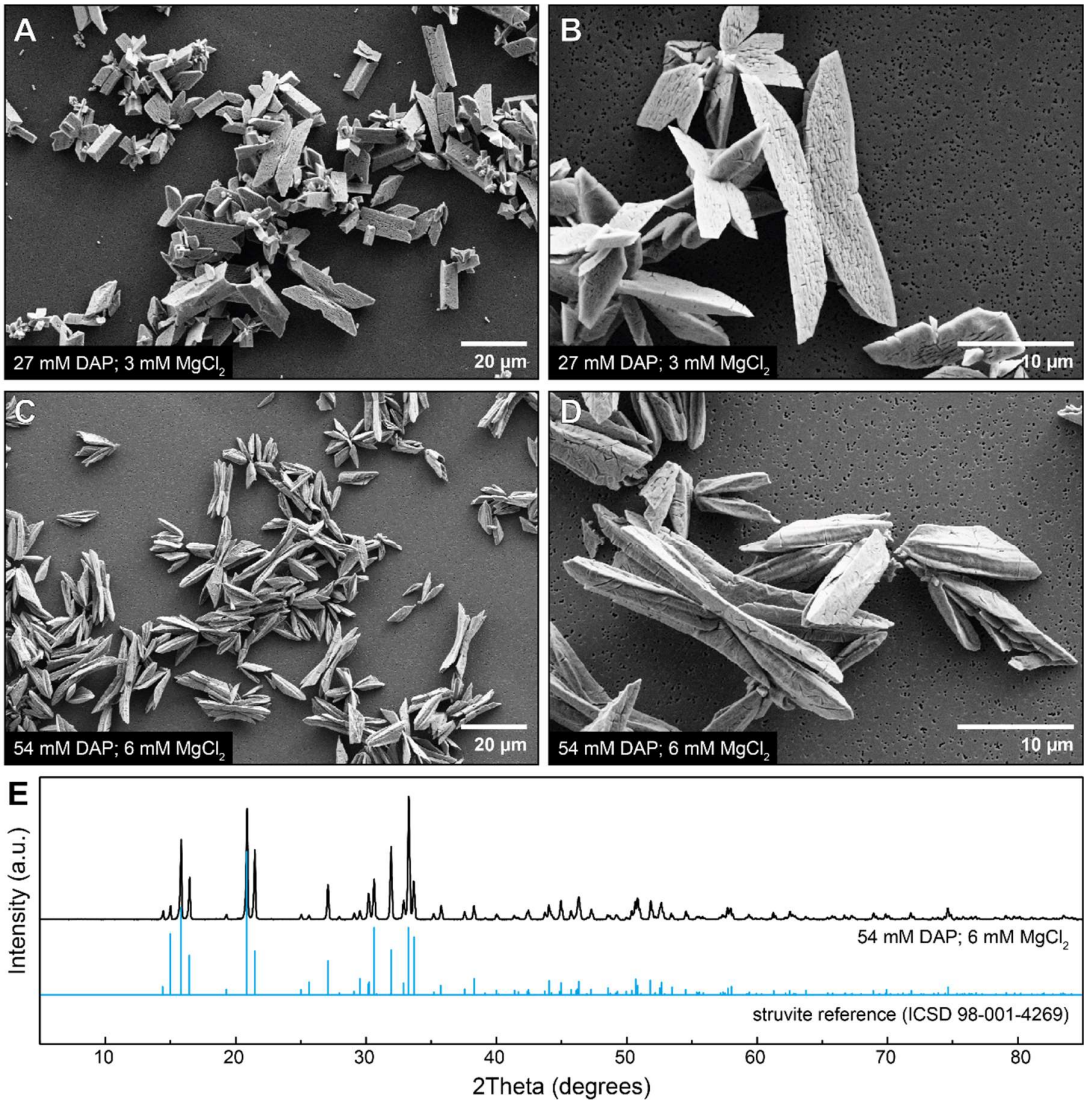

Figure 1. SEM image of precipitates from (**A**,**B**) a 27 mM DAP + 3 mM $MgCl_2$ solution and (**C**,**D**) a 54 mM DAP + 6 mM $MgCl_2$ solution showing butterfly-shaped crystals of struvite. (**E**) XRD pattern of the precipitate from a 54 mM DAP + 6 mM $MgCl_2$ solution showing that struvite was the only phase present in the reaction product.

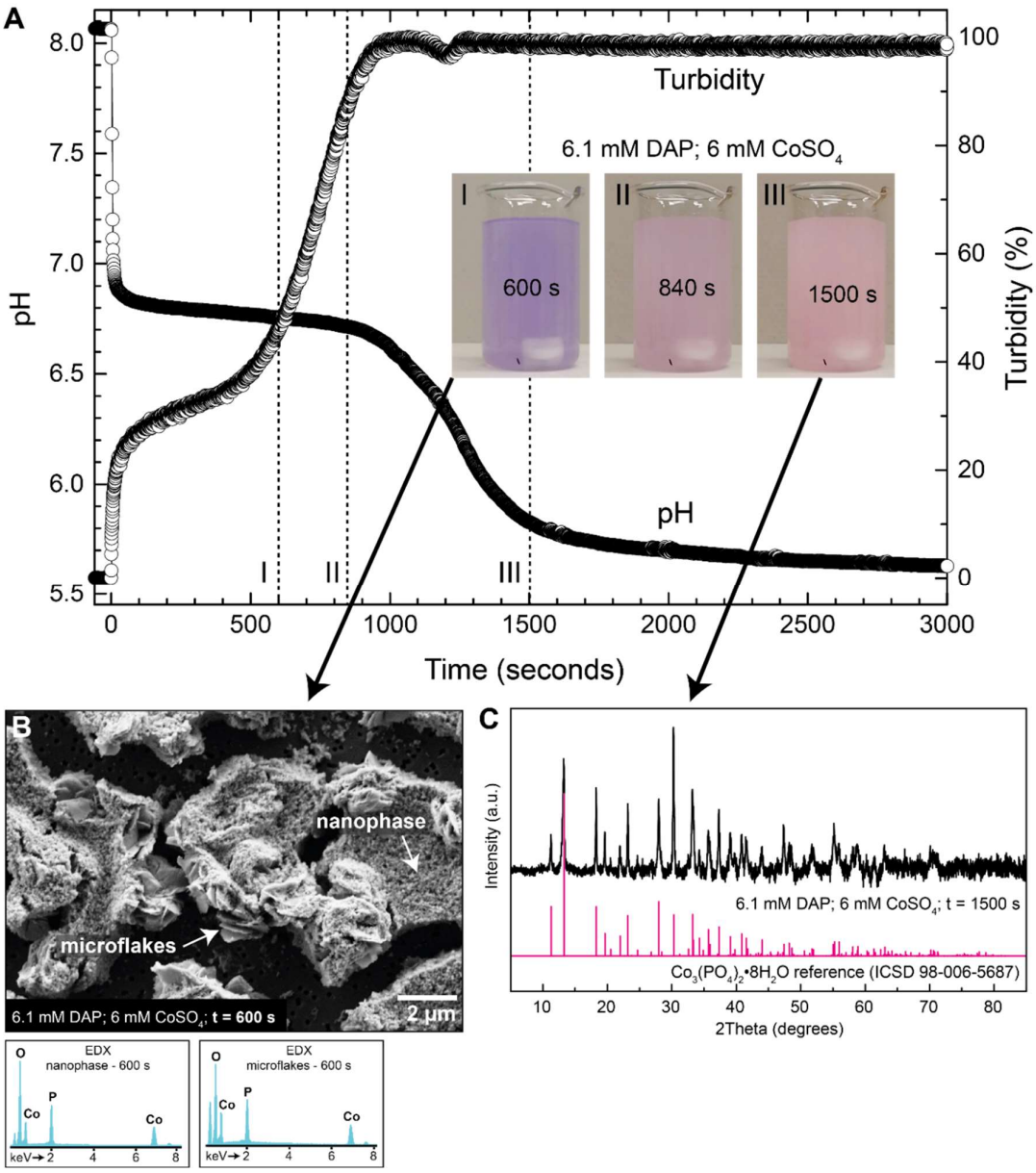

Figure 2. (**A**) The development of pH and turbidity in experiments with 6.1 mM DAP + 6 mM $CoSO_4$ over a period of 3000 s. Inset: Time series of photographs of the reaction solution/suspension showing the gradual color change from blue to pink over the course of ~1500 s. (**B**) Top: SEM image of precipitates after a reaction time of 600 s showing the presence of µm-sized flaky crystals inside a matrix of a nanoparticulate phase. Bottom: EDX analyses of the nanophase and microflakes. (**C**) XRD pattern of the final reaction product (sampled after 1500 s) matching the reference pattern for cobalt phosphate octahydrate ($Co_3(PO_4)_2 \cdot 8H_2O$).

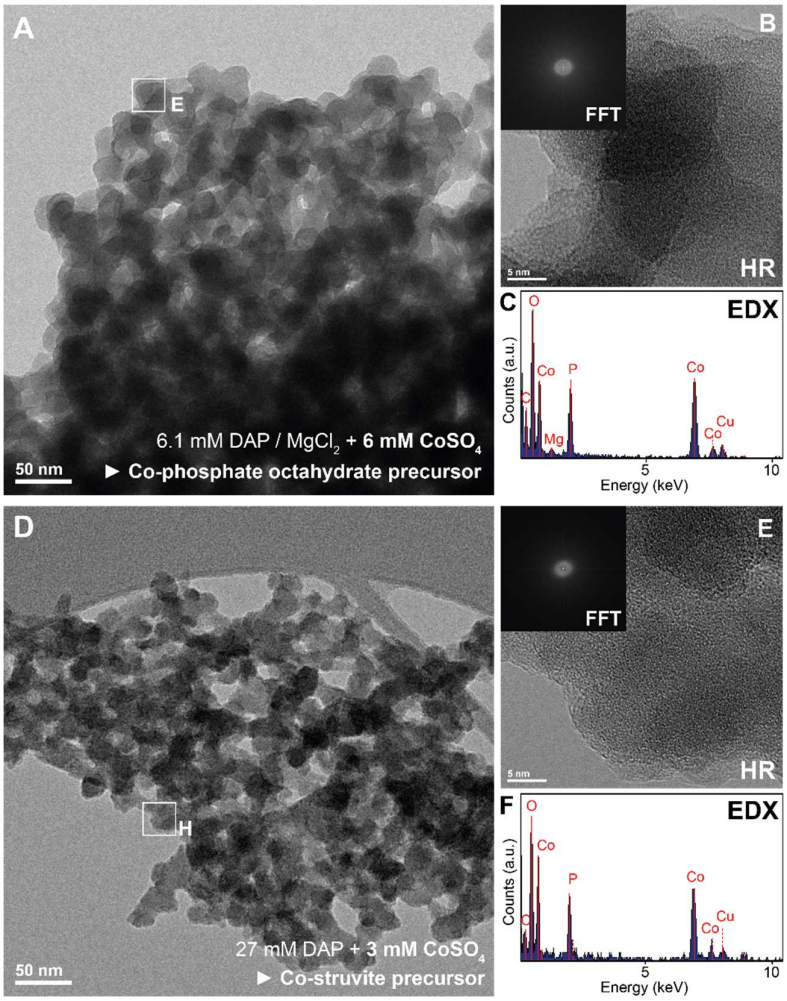

Figure 3. Conventional TEM analyses of the nanoparticulate precursors of (**A**–**C**) cobalt phosphate octahydrate (precipitated from a 6.1 mM $MgCl_2$-DAP + 6 mM $CoSO_4$ solution) and (**D**–**F**) Co-struvite (precipitated from a 27 mM DAP + 3 mM $CoSO_4$ solution). All particles were sampled after ~10 s of reaction and imaged after drying. Both nanoparticulate precursors were similar in size and shape to the Mg-Co-struvite precursor that was formed in 6.1 mM $MgCl_2$-DAP + 1 mM $CoSO_4$ solutions (cf., Figures 6A–C in the main text). The lack of lattice fringes and spots in the high resolution images and the corresponding FFT patterns (**B**,**E**) suggests an amorphous structure.