

**Table S1.** Summary of the experimental conditions analyzed. The grey shaded cells imply the analysis conducted. Among all the synthesis and sintering conditions, a complete transformation of CDHA to  $\beta$ -TCP was only observed for the pH 5.5/750°C and pH 5.5-6.5/900°C samples shown with dashed red frames. Therefore, further investigations were only carried out for the samples that had been synthesized at pH 5.5.

|                    | Samples |      |      |      |              |              |        |      |              |        |      |      |        |      |      |        |      |      |
|--------------------|---------|------|------|------|--------------|--------------|--------|------|--------------|--------|------|------|--------|------|------|--------|------|------|
|                    | pH 5.5  |      |      |      |              |              | pH 6.5 |      |              | pH 7.0 |      |      | pH 7.5 |      |      | pH 8.0 |      |      |
| Analysis Technique | AD      | S600 | S700 | S720 | S750         | S900         | AD     | S750 | S900         | AD     | S750 | S900 | AD     | S750 | S900 | AD     | S750 | S900 |
| XRD                |         |      |      |      | $\beta$ -TCP | $\beta$ -TCP |        |      | $\beta$ -TCP |        |      |      |        |      |      |        |      |      |
| Raman Spec.        |         |      |      |      | $\beta$ -TCP | $\beta$ -TCP |        |      | $\beta$ -TCP |        |      |      |        |      |      |        |      |      |
| TEM                |         |      |      |      |              |              |        |      |              |        |      |      |        |      |      |        |      |      |
| MTT                |         |      |      |      |              |              |        |      |              |        |      |      |        |      |      |        |      |      |

**AD:** as-dried    **S600:** sintered at 600°C    **S700:** sintered at 700°C    **S720:** sintered at 720°C    **S750:** sintered at 750°C    **S900:** sintered at 900°C