Supplement Figure 1. TEM micrographs of ACP (A) and LCCA (B), and their corresponding diffraction patterns (C) and (D). Diffraction pattern (C) is taken from a bare carbon coated grid.
Supplement Figure 2. Absorbance FTIR spectra of HA (black), OCP (blue); LCCA (red) and ACP (green).
The FTIR spectrum of HA is characterized by a sharp peak at 3572.5 cm\(^{-1}\), corresponding to the hydroxyl stretching band of structural OH\(^-\) groups in the HA crystalline lattice, a doublet of phosphate \(v_4\) peaks at 603 and 566 cm\(^{-1}\) and a split \(v_3\) phosphate absorbance band with two maxima around 1040 cm\(^{-1}\) and 1090 cm\(^{-1}\) (Lehr et al., 1967; Ou-Yang et al., 2000; Rehman and Bonfield, 1997). The highly crystalline stoichiometric HA is also characterized by a band at 633 cm\(^{-1}\) arising from OH\(^-\) libration (Ou-Yang et al., 2000).

The spectrum of OCP lacks the sharp 3572.5 cm\(^{-1}\) band and has 2 well defined phosphate \(v_4\) peaks at 562 and 602 cm\(^{-1}\). Its \(v_3\) band is much broader than HA with the maximum at 1024 cm\(^{-1}\) and with a number of smaller phosphate \(v_3\) peaks at 1076, 1008 and 1124 cm\(^{-1}\). It also contains a well distinguished HPO\(_4^{2-}\) asymmetric stretching peak at 916 cm\(^{-1}\) which is absent in HA spectra. All these features are characteristic of stoichiometric OCP mineral (Dekker et al., 2005; Wang et al., 2008).

The spectrum of low crystallinity carbonated apatite (LCCA) contains a \(v_3\) band with the maximum at 1032 cm\(^{-1}\) and a shoulder around 1100 cm\(^{-1}\) and doublet \(v_4\) band with maxima at 563 and 602 cm\(^{-1}\) (Gadaleta et al., 1996; Ou-Yang et al., 2000; Termine and Posner, 1966). An absorbance band in the 1400-1500 cm\(^{-1}\) region indicates the presence of carbonate ions in the mineral. The carbonate content has been determined to be \(\sim 1.1\%\) w/w using carbonate \(v_3\) to phosphate \(v_3\) intensity ratio as described elsewhere (Elangovan et al., 2007; Ou-Yang et al., 2001).

The ACP spectrum contains characteristic broad \(v_4\) and \(v_3\) phosphate bands with the maxima around 565 cm\(^{-1}\) and 1056 cm\(^{-1}\), respectively, as reported elsewhere (Gadaleta et al., 1996; Ou-Yang et al., 2000; Termine and Posner, 1966). The strong broad bands with maxima at 1644 and 3380 cm\(^{-1}\) indicate the presence of bound water. The absorbance peak in the 1400-1500 cm\(^{-1}\) region suggests the presence of small amount of CO\(_3^{2-}\) in the mineral, between 0.5 and 1\% w/w based on the calculated carbonate/phosphate intensity ratio.

References:


