Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Figure S1 shows indexed powder X-ray diffraction patterns of single crystals of quartz (SC, upper line) and polycrystalline chert (PC, lower line) with particle size distributions of 10 µm. We note the sharp diffraction peaks of the SC compared with PC (Fig 1A), in particular in the complex peak structures around 80 °2Theta (Fig 1B). This diffraction patterns confirms that the SC is indeed long-range ordered quartz crystal, and that the PC is microcrystalline quartz.

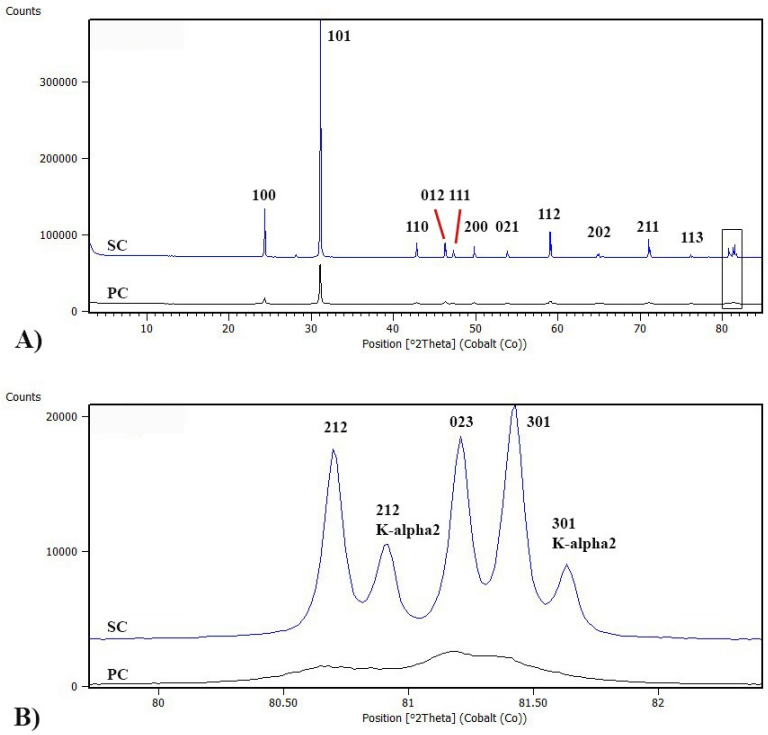

Figure S1. Indexed powder X-ray diffraction patterns for polycrystalline chert (PC) and single crystals of quartz (SC) with mean particle size distributions of 10 µm. 1A) Diffractogram in the range 5-80.5 °2Theta, indexing the crystallographic planes. A rectangle shows the complex peak structures around 80 °2Theta (Fig 1B). Some impurities were found below 1% and were unindexed.

Figure S2 shows spectra of calcite and carbonated hydroxyapatite main peaks during the last three runs of the grinding curve method (at the limit of hand grinding, below the wavelength in the probe). Carbonated hydroxyapatites materials show that bones following recrystallization have higher asymmetry values that correspond to higher crystallite-size-related scattering compared with single crystals of geological apatites. This was observed in the narrower peak widths of the polycrystalline material bone (following recrystalization, when the collagen and the organic material is removed), although bones have smaller crystallite size and higher atomic disorder. This was also observed when comparing a single crystal of geological calcite (spar) with geological chalk (polycrystalline calcite).

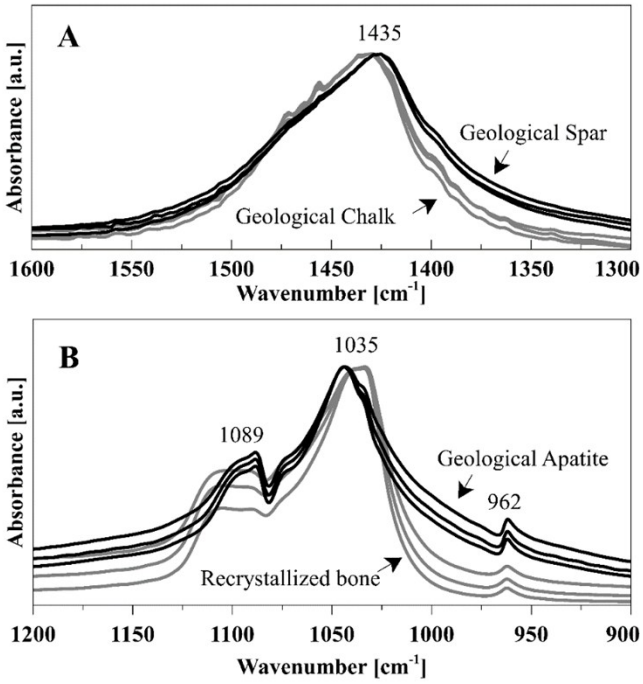

Figure S2. Spectra of calcite (A) and carbonated hydroxyapatite (B) during the grinding curve method last three grounds. Spectra show that polycrystalline materials such as geological chalk and recrystallized bones (grey) show narrower peaks and higher asymmetry values compared with single crystals of calcite spar and geological apatite (black), even though chalk and recrystalized bones have lower crystallinity.