Ca\(^{10-y}\)Na\(^y\)[(PO\(_4\)\(_{6-y}\)CO\(_3\)\(_y\)](OH\(_{2-2x}\)CO\(_3\)\(_x\)), a suite of Na-bearing type A-B CAP, of general composition B when substituting for the phosphate group. Recent study of carbonate hydroxyl-apatite is herewith abbreviated as CAP: also, carbonate requirements (Fleet and Liu 2007). Also, biological apatite was demonstrated that the Na\(^+\) and channel carbonate ion defects were coupled locally by charge and spatial compensation requirements (Fleet and Liu 2007). Also, biological apatite was reinterpreted as Na-bearing type A-B CAP with channel carbonate up to 50% of total carbonate. We presently report hydrogen carbonate (bicarbonate) in the apatite channel of Na-bearing type A-B CAP synthesized under high pressure from carbonate-rich bulk compositions. The hydrogen-carbonate ion has previously been reported as an anion defect in biogenic (e.g., Bischoff et al. 1985) and room-temperature laboratory-precipitated (Feng et al. 2006) calcite. Hydrogen carbonate associated with bone is the most important agent for neutralizing acidity in the body (e.g., Bushinsky et al. 2002), but has not yet been identified as an intracrystalline component of the hydroxyl-apatite nanocrystals in bone.

**EXPERIMENTAL METHODS**

Sodium-bearing CAP was synthesized at 1 GPa and 800–1350 °C using a Depths of the Earth Company Quickpress piston-cylinder device with a ⅜ inch assembly and platinum capsules and at 0.1 GPa and 800 °C using a cold-seal hydrothermal vessel and gold capsules. Starting compositions were prepared from analytical grade CaHPO\(_4\), Na\(_2\)CO\(_3\), Ca(OH)\(_2\), and CaCO\(_3\). These salts were mixed in stoichiometric proportions corresponding to a nominally ideal type B carbonate apatite formula of Ca\(_{10-y}\)Na\(_y\)[(PO\(_4\)\(_{6-y}\)CO\(_3\)\(_y\)](OH\(_{2-2x}\)CO\(_3\)\(_x\)], with y = 2 or 3 and a fluid phase in excess. All experiments were quenched at pressure by switching off the furnaces. Further experimental details are given in Fleet and Liu (2007).

The products were characterized by optical microscopy, powder X-ray diffraction (XRD; Rigaku D/Max-B system; CoK\(_\alpha\) X-radiation), and Fourier transform infrared (FTIR) spectroscopy (Nicolet Nexus 670 FTIR spectrometer). Infrared spectra were obtained for both hand-separated CAP crystals and bulk samples using KBr pellets (Figs. 2 and 3). We also collected a spectrum for sodium hydrogen carbonate (Fig. 2) using analytical grade NaHCO\(_3\) (synthetic nacalite). About 10 mg of sample was first ground to a powder, then diluted in an agate mortar with 1 g of KBr and ground under an infrared heating lamp to a grain size of ~25 μm; transparent pellets were made under vacuum at a pressure of 200 kg/cm\(^2\).

**RESULTS AND DISCUSSION**

The present FTIR spectrum of sodium hydrogen carbonate (Fig. 2) corresponds closely to the IR spectrum in White (1974; his Fig. 12.16), taking into account the much greater band widths in the earlier study. Our interpretation and band assignments