SYNOPSIS

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Francolite in a concretion from argillaceous sediments in the Westphalian of Yorkshire

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SYNOPSIS. A phosphate-rich carbonate nodule from carboniferous mudstones has been studied by wet chemistry, X-ray diffraction, and electron microprobe. Partial heavy-liquid separation has enabled characterization of the phosphate phase as francolite (carbonate fluorapatite) with a composition $Ca_{10}(PO_4)_{5.59}(CO_3)_{1.00}((OH)_{1.49}F_{2.10})$. Diffractometer data for this mineral is presented and cell dimensions are calculated as $a = 9.349$ Å, $c = 6.887$ Å with $c/a = 0.737$. The problem of the structural positioning of carbon in francolite is discussed.

The francolite is seen in thin section as a structureless groundmass enclosing siderite spherulites. Electron microprobe X-ray distribution photographs for P, Al, Si, Mg, and Fe show the relationship of these two phases to quartz, pyrite, and at least two clay minerals. One of the latter is intimately mixed with francolite.

Possible origins of phosphatic nodules are discussed. Textural evidence in the present case strongly suggests that the francolite is concretionary and formed during early diagenesis possibly by replacement of earlier calcite. Phosphate was probably derived from protein degradation, which also maintained the alkaline pH necessary for francolite formation.

Microprobe X-ray scanning photographs appear to have great potential in textural studies on fine-grained sediments and it is anticipated that work currently in progress on other concretionary minerals and host sediments will provide valuable information on diagenetic reactions. *The full paper will appear in the Miniprint section of this journal.*

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