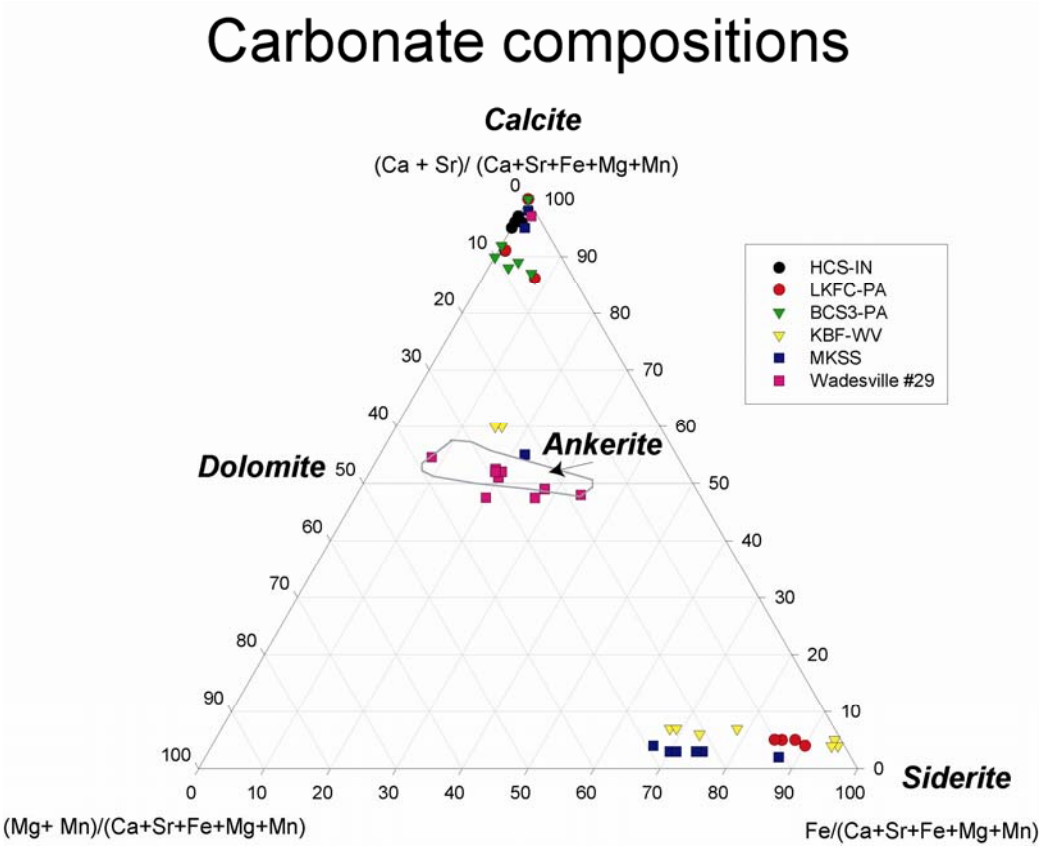

Figure 5.31. Carbonate mineral compositions. Molar cation ratios based on data in Appendix 5.1. The ankerite field is based on the compositional ranges for ankerites cited by Chang et al. (1996).

Leach column residues

Several months elapsed between the end of the leaching experiments and opening the columns. Thus, any minerals that were near-saturation in the final water column may have evaporated and precipitated, which complicates interpretation of weathering products. Residues differ in color from the starting material. The raw Houchin Creek Shale, for example, is black but the leach column residue material has a brownish-orange caste and some rock chips were partially coated with iron precipitates (Figure 5.32).

Carbon and sulfur analyses for leach column residues are listed in Table 5.2. Pre-and post leach total sulfur analyses are generally comparable or indicate an increase, and might reflect sample heterogeneity or analytical error. Quantitative XRD analyses of the leach column residues for HCS-IN (see LCR columns in Table 5.4) suggest that gypsum may have precipitated. The raw and LCR gypsum estimates for HCS-IN are 6.4 and 9.1 weight percent, respectively. The carbon species were determined for the LCR samples; these data indicate that CO_2 apparently decreased for HCS-IN and KBF-WV, but increased for the other samples. All of the shales contain graphite and organic carbon in the leach column residue. Carbon species were not determined for the raw material. The "before leaching" (raw and LTA) and "post-leaching" (LCR) XRD data suggest an apparent decrease in carbonate minerals for samples HCS-IN and BCS-3 and an apparent decrease in pyrite for samples HCS-IN and LKFC-PA. Paste pH measurements on leach column residues indicated that although the effluents from all columns at