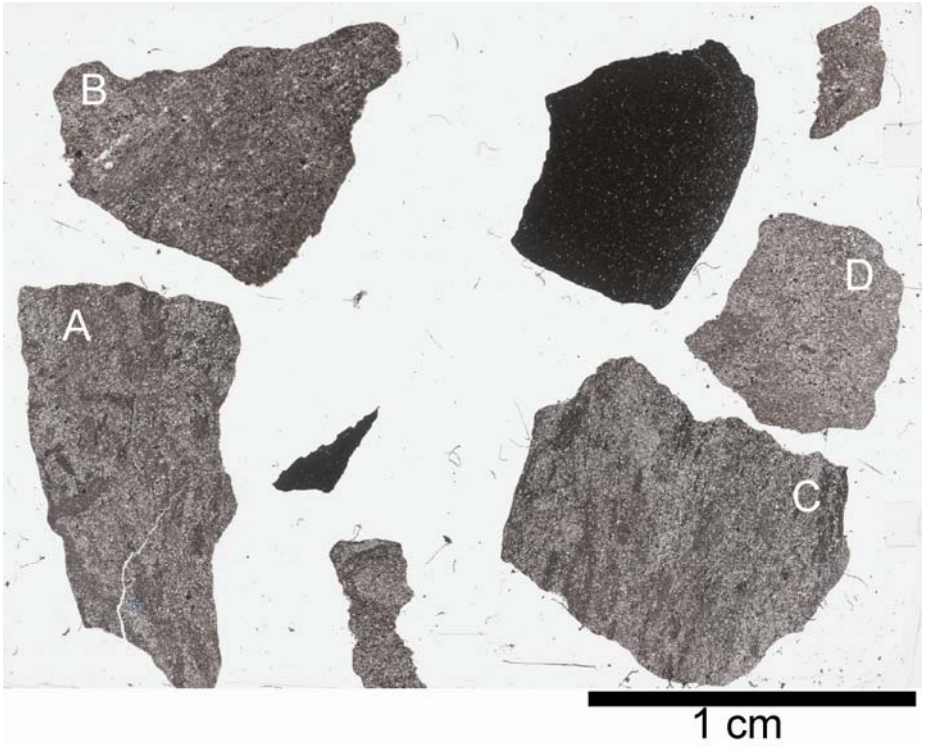

Figure 5.11. Kanawha Black Flint Shale (Sample KBF-WV). Scanned image of polished thin section.

Kanawha Black Flint Shale (Sample KBF-WV). The Kanawha Black Flint Shale was included in the phase 3 tests as a "gray-zone" sample from an area in West Virginia that might contain elevated selenium (Table 5.1). Gray zone samples are those samples for which alkalinity or acidity production is difficult to predict because of moderate amounts of neutralization potential and sulfur. The shale had low NP and contained about 0.2 weight percent sulfur. The selenium content of composite sample analyzed for this studied was below the detection limit (<3 parts per million selenium).

The shale is a patchwork of dark-colored clay-rich areas and coarser-grained quartz-rich areas (Figure 5.11). Low temperature ash (99 weight percent) and a relatively low loss-on-ignition (9 weight percent) indicate a relatively low organic content. XRD analysis estimated the mineralogical composition (in weight percent) as: 42 % quartz, 34% micas and clay minerals, 6% chlorite, <1% pyrite, 11% feldspar, and 4% carbonate minerals (Table 5.4). Laths of colorless muscovite, brown biotite, green chlorite and clots of brownish clay in a carbonate matrix were readily identifiable by optical microscopy (Figure 5.12). Despite the low estimates of organic material and pyrite for the bulk rock, both were present in many of the rock chips. The shale was more sodic (0.74 weight percent Na_2O) than the other samples (Table 5.2). It was also the most feldspathic (Table 5.4). Microprobe analysis confirmed the XRD identification of albite as the major feldspar present. Both Fe-rich carbonate and calcite were identified by SEM (Figure 5.13). Matrix carbonate grains (on the order of 5 micrometers or smaller) were slightly zoned, with iron increasing towards the rim of the grain. Zoned carbonate rimming a sphalerite grain explained the zinc detected in the whole-rock chemistry. Nearly pure calcite fragments (20 micrometers long) are rimed by pyrite (Figure 5-13).