

Lower Kittanning Shale (Sample LKFC-PA). The Lower Kittanning Shale sample was collected from the Redbank Creek watershed in Pennsylvania, where overburden produces alkaline drainage although the NP is not very high. Sample LKFC contains about 1 weight percent sulfur and low NP. The Lower Kittanning Shale is coarser grained than the Houchin Creek Shale. Rock chips exhibit a range of textures in thin section. Some rock chips contain quartz grains up to 0.1 millimeters in diameter (Figure 5.6, chips A,B,C,F), some have more uniform, finer-grained, textures, and one chip (G) contained fossils. LKFC has low whole-rock loss-on-ignition and a low-temperature ash concentration of 99 weight percent indicating low total organic content. The XRD-based estimate of amorphous content of the shale is 67 weight percent (Table 5.2). The crystalline part of the shale is composed of the following (in weight percent): ~37 % quartz, 34 % micas and clay minerals, 10% chlorite, 8% pyrite, 3% feldspar, and 5% carbonate minerals (Table 5.4). Pyrite occurs as isolated cubes and as framboids scattered throughout all of the rock chips (Figure 5.7). Accessory minerals include apatite, which accounts for much of the phosphorous and some of the calcium in the rock. Although apatite is an accessory mineral present in low concentrations, apatite has $NP > 0$ and can provide acid neutralization, especially where it is in close proximity to reacting pyrite (Figure 5.8). Framboids occur as rounded clusters of hundreds of discrete grains and as strings of crystals arranged like peas in a pod within organic material (Figure 5.9). These textures indicate an abundance of pyrite surfaces available for oxidation. Siderite is the dominant carbonate mineral identified by XRD. The siderite is not readily identified by optical microscopy because it is so fine-grained. Of the 18 rock chips examined, only chip G contained calcite, which is present as fossil material (Figure 5.10).

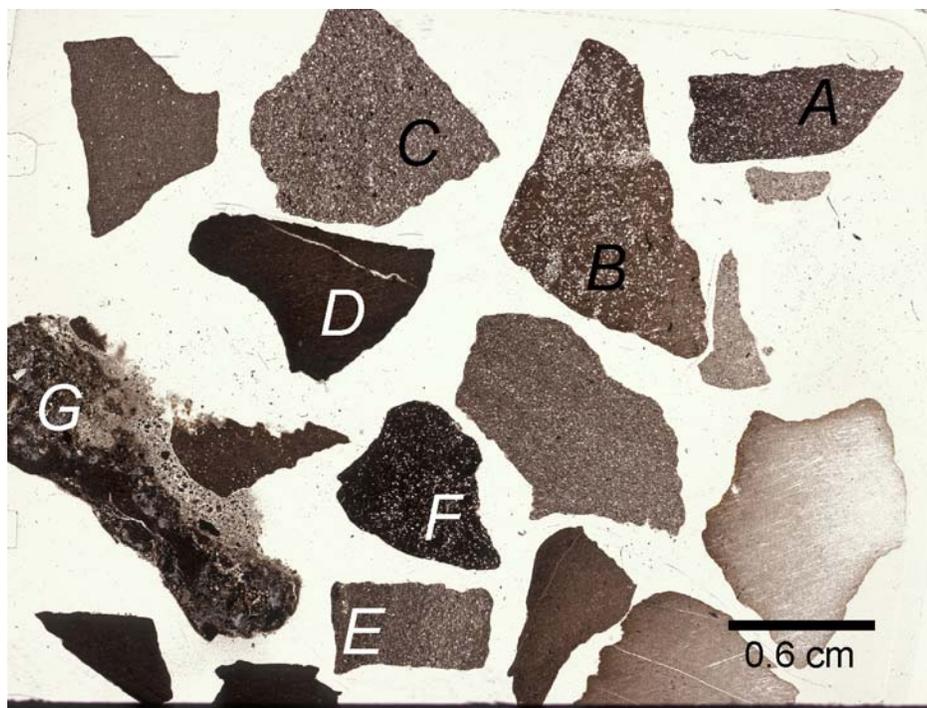


Figure 5.6. Lower Kittanning Shale (Sample LKFC-PA). Scanned image of polished thin section. Note the heterogeneous texture the different chips.