Table 5.3. Minerals.
[Weathering behavior comments based on Goldrich's (1938) mineral-stability series in weathering and Sverdrup's (1990) relative reactivity of monomineralic samples; NP classes based on Jambor et al. (2002)]

Mineral	Ideal formula	Weathering behavior	NP<0	Inert	NP>0
Quartz	SiO_2	Inert		X	
Chlorite	$(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$	Intermediate weathering			X
Micas and clays					
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	Very slow weathering		X	
Phengite	Series between muscovite and $K(Mg,Fe^{2+})(Al,Fe^{3+})Si_4O_{10}(OH)_2$			X	
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	Intermediate weathering			X
Illite	$K_{0.65}Al_2(Al_{0.65}Si_{3.35}O_{10})(OH)_2$	Very slow weathering			
Kaolinite	$Al_2Si_2O_5(OH)_4$	Slow weathering		X	
Feldspars					
Albite	$NaAlSi_3O_8$	Slow weathering		X	
Anorthite	$CaAl_2Si_2O_8$	Fast weathering		X	X
Potassium feldspar	$KAl_2(AlSi_3O_{10})(OH)_2$	Very slow weathering		X	
Accessory minerals					
Apatite	$Ca_5(PO_4)_3(OH,F,Cl)$	Fast weathering			X
Zircon	$ZrSiO_4$	Inert		X	
Rutile	TiO_2	Inert		X	
Sulfate minerals					
Gypsum	$CaSO_4 \bullet 2H_2O$			X	
Barite	$BaSO_4$	Insoluble		X	
Sulfide minerals					
Pyrite	FeS_2		X		
Carbonate minerals					
Calcite	$CaCO_3$	Dissolving			X
Siderite	$FeCO_3$	Dissolving	X		X
Ankerite	$Ca\ (Fe,Mg,Mn)(CO_3)_2$	Dissolving	X		X

Houchin Creek Shale (Sample HCS-IN). The Houchin Creek Shale was selected for weathering experiments because of its high total sulfur content and low NP values (Table 5.1). In thin section, the shale is a black, very fine-grained homogeneous rock; one of the eight fragments contained clots and veinlets of coarse-grained calcite (Figure 5.3). The shale contains significant amounts of organic material, as indicated by thin section and SEM observations (Figure 5.4) and the low-temperature ash measurement of 79 weight percent. Sample HCS-IN also had the highest LOI of all the shales. The post-leach residue contained 18.1% total carbon, most of which is organic (Table 5.2). The crystalline part of the shale was composed of ~32% quartz, 26% micas and clay minerals, 5% chlorite, 17% pyrite, 6% feldspar, ~ 3% carbonate minerals, gypsum, and accessory minerals (Table 5.4). The XRD-based estimate of amorphous content of the shale was 67 weight percent (Table 5.4). Pyrite is scattered throughout the shale as single grains or as clusters of framboids (Figure 5.3*D*). Most of the minerals were so fine-grained that they cannot be readily identified by optical microscopy. SEM images showed that the quartz was present as rounded grains on the order of 5 to 10 micrometers in diameter in a matrix of micas, clays, and other minerals (Figure 5.4).