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Client Sample No. GFR-3_10C	Dukelabs Sample No. N841	Classification: Ferruginous Siltstone
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Color Index (% mafic phases): ~3

Megascopic Sample Description: Reddish-brown -colored and compact ferruginous siltstone (Figure 1) consisting of uniform silt-sized iron-stained quartz and feldspars (K-feldspar and plagioclase) together with subordinate clastic muscovite set in a cemented matrix of reddish-brown clay, calcite, silica, hematite, and other opaque minerals.

Brief Petrographic Description: Clastic texture consisting of subangular grains of quartz and feldspars in murky reddish-brown matrix (Figure 2). Note that rock is at limit of petrographic capability to distinguish minerals accurately and the term clay is only used as a size designation since only x-ray analysis can distinguish among clay varieties.

Mineral Phase	Crystal Size (mm)	Volume %	Mohs Scale	Comments
Quartz	0.1-0.05	32	7.0	Undulose and subangular iron-stained grains and as silica cement
K-Feldspar	0.1-0.05	30	6.0	Altered subangular iron-stained grains
Plagioclase	0.1-0.05	15	6.0	Twinned subangular iron-stained grains
Ferro-clay	var	15	2.0-2.5	Disseminated throughout sample
Muscovite	0.025	4	2.0-2.5	Thin elongate clasts often deformed about predominate clasts
Opauques	var	3	~5.0	Disseminated throughout sample
Carbonate	<0.025	1	3.0	Cement and in pore spaces
Biotite	<0.025	tr	2.5-3.0	Clastic grains
Glaucosite	<0.025	tr	2.0	Rare, disseminated grains
Chlorite	<0.025	tr	2.0-2.5	Rare, disseminated grains

Petrographic Images

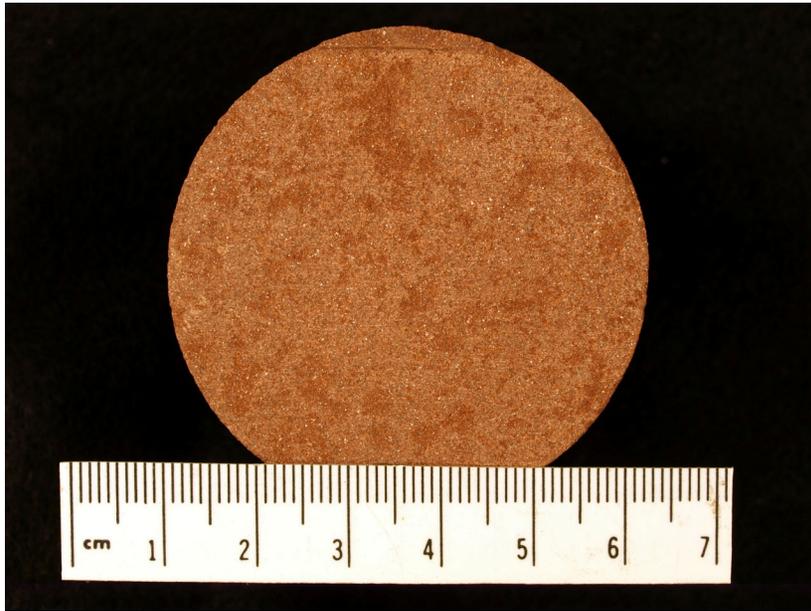


Figure 1 – Macro scale image of sawn rock core consisting of reddish-brown, mottled micaceous siltstone. Mottling is the result of ferro-clay concentrations. Thin section sample cut from Run 10C depth of 106.8’.

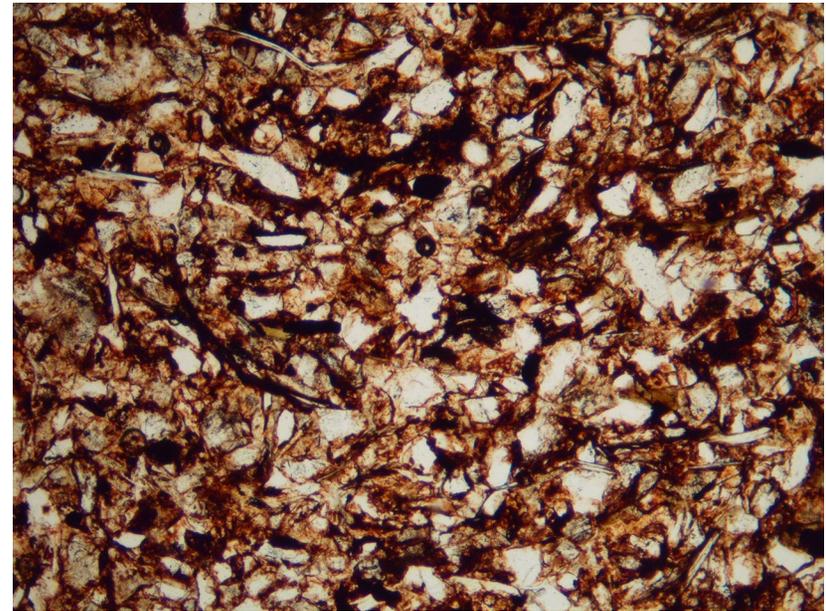


Figure 2 - Photomicrograph showing clastic texture consisting of subangular grains of quartz, K-feldspar, plagioclase, and muscovite mica set in a ferruginous cemented matrix of reddish-brown clay, calcite, silica, hematite, and other opaque minerals.

Note: All Petrographic Images (Width of Field = 1.6 mm)

Petrographic Description and Rock Mass Properties

Sample **N841** is a red-colored compact ferruginous micaceous siltstone consisting of silt-sized iron-stained quartz and feldspars (K-feldspar and plagioclase) together with subordinate clastic muscovite set in a cemented matrix of reddish-brown ferro-clay, calcite, silica, hematite, and other opaque minerals. The silt-sized clasts are subangular and polymict (quartz, K-feldspar, and plagioclase) and are uniform in grain size, varying from 0.5 to 1.0 mm in dimension. They are often cemented together and separated only by thin flakes of clastic muscovite, and areas of opaque minerals and ferruginous clay. The persistence of K-feldspar, muscovite, and biotite in the same sediment are indicators of chemical weathering immaturity found in fresh water depositional environments. For the quartz and feldspar content, rapidly uplifted crystalline source rocks are indicated.

Ferruginous cements in sedimentary rocks are often associated with lithification of terrestrial floodplain deposits. In these environments alternating wet and dry conditions foster the introduction of iron into solution prompting iron-staining and oxidation. In addition, iron-bearing phases in the sediment can produce iron-bearing solutions that become part of the cement.

Such reddish-brown colored terrestrial siltstone/shale sedimentary rocks are commonly found in the finer grained facies of the Passaic Formation, a part of the Mesozoic Newark Series of New Jersey.



Petrographer: Charles Merguerian, Ph.D.

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