



GGY 4031
LECTURE NOTES 2a

SEDIMENTOLOGY

Composition, Classification, and Diagenesis of Sedimentary Rocks

SILICICLASTIC SEDIMENTS AND ROCKS

Siliciclastic Rock Components: 3 components

namely:

- Grains (=clasts): larger mineral particles or rock fragments
- Matrix: finer particles in the interstices between larger ones
- Cement: post depositional, chemically precipitated minerals filling remaining interstices between grains

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SANDSTONE

Sandstones make up 20-25 percent of all sedimentary rocks.

The detrital particle in sandstones can be divided into:

- A) Quartz (Q)
- B) Feldspar (F)
- C) Rock Fragment (RF) or Lithic Fragment (R-L)
- D) Micas and clays
- E) Heavy minerals
- F) Other constituents

A+B+C= Framework composition

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• Quartz

Quartz (SiO_2) is the dominant mineral in most sandstones, making up on average about 50-60 percent of the framework fraction. Quartz can occur as single (monocrystalline) grains or as composite (polycrystalline) grains

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• Feldspars

Feldspar minerals make up about 10-20 percent of the framework grains of average sandstones. They are the second most abundant mineral in most sandstones.

Several varieties of feldspars are recognized on the basis of differences in chemical composition and optical properties. They are divided into two broad groups: alkali feldspars (potassium feldspars) and plagioclase feldspars.

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- **Rock Fragments** (make up about 10-15% of the siliciclastic grains in average sandstone)
 - ✓ **Igneous rock fragments**-clasts of any kind of igneous rock, however, fragments of fine-crystalline volcanic rock are most common in sandstones.
 - ✓ **Metamorphic rock fragments**-may include clasts of any kind of metamorphic rock; however, meta quartzite, schist, phyllite, slate, and argillite clasts are most common in sandstones.
 - ✓ **Sedimentary rock fragments**-clasts of any kind of sedimentary rock possible in conglomerates; clasts of fine sandstone, siltstone, shale, and chert are most common in sandstones; limestone clasts are comparatively rare in sandstones

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• Clay and Micaceous

Clay minerals and fine micaceous minerals include the kaolinite group, illite group, smectite group (montmorillonite a principal variety), and chlorite group; fine micaceous are principally muscovite (sericite) and biotite

• **Chemical Cements** (abundance variable)

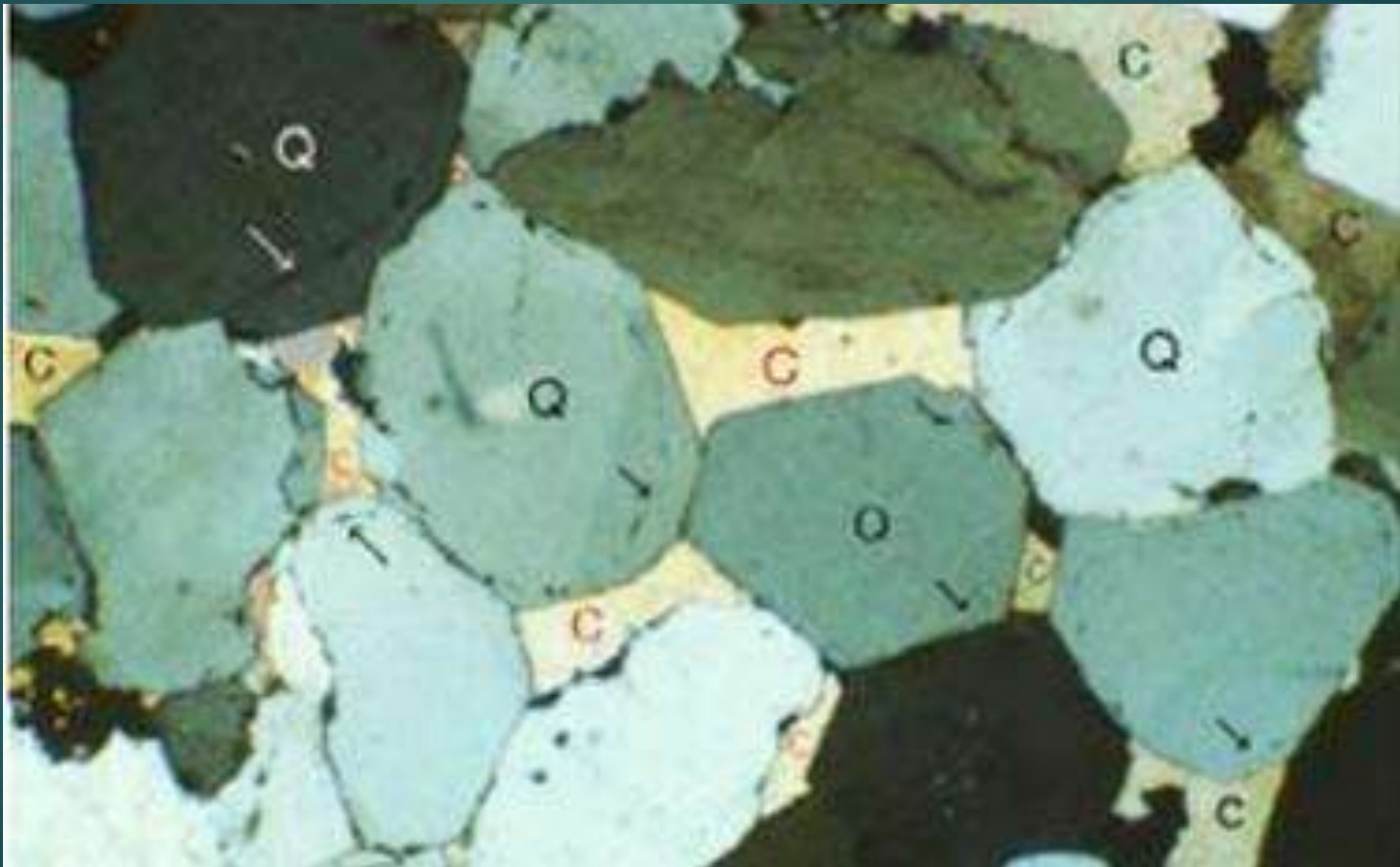
✓ Silicate minerals-predominantly quartz (overgrowth); others may include micro-quartz (chert), opal, feldspars, and zeolites.

✓ Carbonate minerals-principally calcite; less commonly aragonite, dolomite, siderite. Iron oxide minerals-- hematite, limonite, goethite.

✓ Sulfate minerals-anhydrite, gypsum, barite.

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- **NOTE:** The compositions and proportions of these components are important aspects of their description, classification and interpretations



Photomicrograph of sandstone