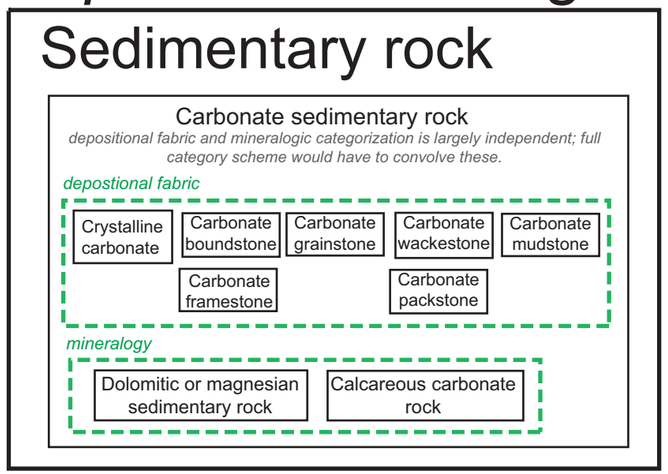
GeoSciML lithology vocabulary

Draft 2/24/2008
Stephen M. Richard

This document is a 'road map' for the lithology vocabulary used by the NGMDB geologic map portal. The words in boxes with black outlines are terms in the vocabulary. These are meant to be used for specifying the rock types that compose a geologic unit. The concepts represented are hand-sample scale rock types to be treated as material constituents of a geologic unit.
In each diagram, flow is generally from more general to more specific categories from top to bottom.

This vocabulary includes slightly larger collection of terms than GeoSciML draft lithology vocabulary. Intention is to keep this vocabulary synchronized with GeoSciML vocabulary, such that more specific terms that are included in NGMDB portal vocabulary, will always map to concepts in GeoSciML vocabulary unambiguously.

Explanation of diagrams



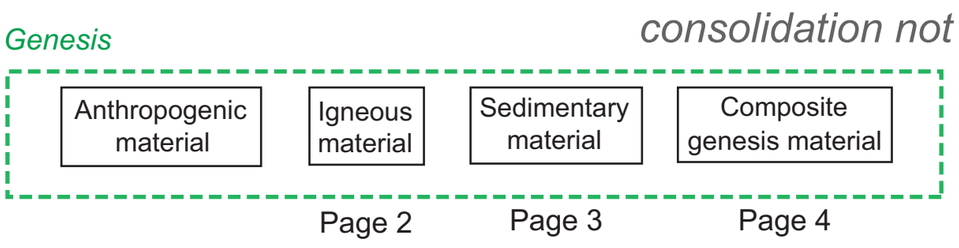
Definitions or scope notes for categories are in accompanying text document.

All terms in solid-black-line boxes are lithology categories; Terms not in boxes are used for identifying sub vocabularies.

A green-dashed-line box indicates that categories within that box are mutually exclusive, e.g. Carbonate sedimentary rock has two groups of subcategories--one group defined based on depositional fabric, and a second group defined based on mineralogy. The green-text label specifies the property used to distinguish subcategories within the associated green-dashed-line box.

Containment of a boxed group within another boxed group indicates subcategories, e.g. Carbonate sedimentary rock is a kind of Sedimentary rock, and Carbonate packstone is a kind of Carbonate sedimentary rock. In some cases for which only one subcategory is included, or there is no unifying property used to define subcategories, stacking of black-outline boxes in direct contact is used to represent 'Kind-of' or subcategory relationship.

Other usage rules are specified in notes on the diagrams.



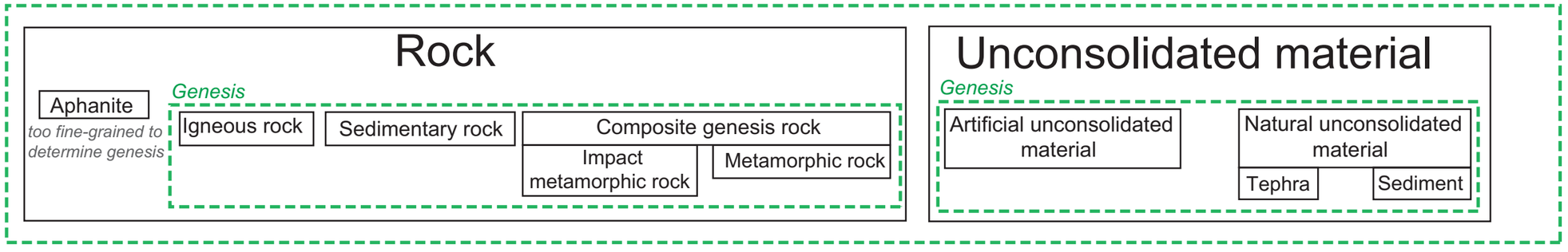
consolidation not specified

Breccia

Breccia may be composite (impact or fault-related), igneous, or sedimentary

no term included for logical equivalent of NADM Compound-Material, which would subsume all categories included.

Lithology not specified



Igneous material

silica content

- Basic igneous material
- Intermediate composition igneous material
- Acidic igneous material

- Fragmental igneous material

Igneous rock

Consolidation

pyroclastic categories overlap with composition and mineralogic categories

Pyroclastic material

consolidation

- Pyroclastic rock
  - Tuff-breccia, agglomerate, or pyroclastic breccia
  - Ash tuff, lapillistone, and lapilli tuff
- Tephra
  - Ash breccia, bomb, or block tephra
  - Ash and lapilli

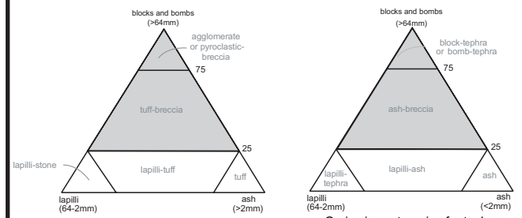
grain size

Grain size, texture

these categories have no compositional denotation

- Glassy igneous rock
- Porphyry
- Aplite
- Pegmatite
- Fragmental igneous rock

porphyry may be fine-grained or coarse-grained



Grain size categories for pyroclastic rocks.

Grain size categories for tephra

Based on Gillespie and Styles (1999), Figure 8, which cites 'modified from Fisher and Schminke, 1984.'

unusual or exotic igneous rock types may overlap with other composition based categories, but are distinguished based on textural and mineralogical criteria

composition,texture

- Exotic composition igneous rock
  - Carbonatite
  - Exotic alkalic igneous rock
  - Exotic alkaline rock

Kalsilite- or melilite-bearing igneous rocks

Kimberlite, lamproite, lamprophyre

silica content

- Ultrabasic igneous rock
  - Peridotite
  - Pyroxenite
  - Hornblendite
  - Komatiitic rock
- Basic igneous rock
- Intermediate composition igneous rock
- Acidic igneous rock

mineralogy, texture

If more than 10 percent kalsilite or melilite is present, classify as exotic alkalic rock

Use composition-based basic and acidic instead of color-based felsic and mafic

Streckeisen-based mineralogical categories overlap with composition and grainsize-texture categories

Grain size, texture, Streckeisen based mineralogical categories

(less than 90 percent mafic minerals)

- Quartz rich igneous rock

any igneous rock with greater than 60 percent quartz

- Doleritic rock

finer grained intrusive, typically in dikes or sills

Fine-grained igneous rock

- Rhyolitic rock
- Dacitic rock
- Trachytic rock
- Andesitic rock
- Basaltic rock
- Phonolitic rock
- Tephritic rock
- Foiditic rock

fine-grained categories include both mineralogically defined categories and most closely corresponding TAS categories

Phaneritic igneous rock

- Granitic rock
  - Granite
  - Granodiorite
  - Tonalite

charnokitic rocks go in granitic rock category

- Anorthositic rock
- Syenitic rock
  - Syenite
  - Monzonite
- Dioritic rock
  - Diorite
  - Monzodiorite
- Gabbroic rock
  - Gabbro
  - Monzogabbro
- Foid syenitic rock
- Foid dioritic rock
- Foid gabbroic rock
- Foidolite

any igneous rock with greater than 60 percent felsdpathoid mineral

If melilite or kalsilite is more abundant than feldspathoid phases, rock would be classified as 'Exotic alkalic rock'

Sedimentary material

genesis, composition

- Clastic sedimentary material
- Organic rich sedimentary material
- Carbonate sedimentary material
  - Calcareous carbonate sedimentaary material
  - Dolomitic or magnesian sedimentary material
- Evaporite
- Non clastic siliceous sedimentary material
- Phosphate rich sedimentary material
- Iron rich sedimentary material

Sediment

diamicton *sorting, genesis*

genesis

- Clastic sediment
  - *grain size*
  - Gravel
  - Sand
  - Mud
- Chemical sediment
- Biogenic sediment
  - Ooze

composition

- Iron rich sediment
- Phosphatic sediment
- Non clastic siliceous sediment
- Organic rich sediment
- Carbonate sediment
  - *mineralogy*
  - Calcareous carbonate sediment
  - Dolomitic sediment
  - *grain size*
  - Carbonate sand
  - Carbonate gravel
  - Carbonate mud

These composition categories overlap with chemical and biogenic categories in genesis categorization scheme above.

Consolidation

Sedimentary rock

Clastic sedimentary rock

grain size

- Conglomerate
- Sandstone
- Mudstone
- *fabric*
- Shale

- Diamictite
  - *sorting, genesis*
- Wackestone
  - *undiscernible matrix*

terrigineous clastic carbonate rocks are included in Clastic sedimentary category

Carbonate sedimentary rock

depositional fabric and mineralogic categorization is largely independent; full category scheme would have to convolve these.

depostional fabric

- Crystalline carbonate
- Boundstone
- Grainstone
- Carbonate wackestone
- Carbonate mudstone
- Framestone
- Packstone

mineralogy

- Dolomitic or magnesian sedimentary rock
- Calcareous carbonate rock

Organic rich sedimentary rock

- Peat
- Coal

Iron rich sedimentary rock

- Phosphorite

Non-clastic siliceous sedimentary rock

siliceous sinter, exhalite deposits, chert of uncertain origin

Biogenic silica sedimentary rock

biogenic cherts (radiolarian, spicularite), diatomite and related diagenitic products)

Composite genesis material

Consolidation **Composite genesis rock**

Genesis

Metamorphic rock is kind of Composite genesis rock; other categories here do not specify consolidation state.

Metamorphic rock

fabric

genesis

- Hornfels
- Granofels

Foliated metamorphic rock

fabric

- gneiss
- *grain size*: schist, phyllite, slate

Mylonitic rock

mineralogy Phyllonite

mineralogy

- migmatite
- amphibolite
- eclogite
- marble
- serpentinite
- quartzite

fabric and mineralogic categories of metamorphic rock are overlapping

Fault-related material

genesis

- Breccia-gouge series
- Cataclasite series

Duricrust

silcrete, calcrete, etc.

Bauxite

Impact metamorphic rock