Quadrant II – Transcript and Related Materials (Notes)

Programme	**: Bachelor of Science (Third Year)**
Subject	**: Geology**
Paper Code	**: GEC 109**
Paper Title	**: Metamorphic Petrology**
Unit	**: 3**
Module Name	**: Fabric Types: Relict and Isotropic fabric in metamorphic rocks**
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Notes:

Relict fabric

All metamorphic rocks are originally either sedimentary and igneous rocks, sometimes even metamorphic rocks itself.

The vestiges of the original fabric and composition of the protolith can generally preserved to some degree then the rock is said to have relict fabric.

These fabric is seen in weakly metamorphosed bodies of low grade and perhaps short duration with a little or no deformation.

The term relict or palimpsest, indicates that a feature is inherited from the protolith.

These include features from sedimentary rocks such as bedding, cross-bedding, ripple marks, clastic grain outlines and at times fossil outlines.

The relict features from igneous rocks may include, pillow structures, porphyritic, ophitic structures, graphic texture.

Therefore we can have relict bedding in meta-sediments, or relict porphyritic texture, or even of individual relict minerals

The original minerals may have not survived, however their original outlines or outlines of characteristic mineral assemblages may be visible.

In low grade metamorphosed igneous rocks, the original grain tends to be replaced pseudomorphically by finer grained aggregates that do not disturb the original grain boundaries.

Relict bedding is commonly preserved in low grade metamorphosed sediments, care must be taken in interpreting layering as relict bedding as layering of contrasting mineral composition and fabric can develop during metamorphism.

In such as case, preserved epiclastic grain outlines and graded and cross bedding if any will support recognition of relict bedding.

Isotropic Fabric

They have random aspect and appear the same in any direction (e.g. a bag or marbles or sugar in a jar).

Non- Hydrostatic stresses were significant during their formation.

Sometime the term “massive” is used for isotropic rocks in outcrop or Hand-specimen.

- Typically occur around passively emplaced shallow pluton or magmatic intrusions around aureoles i.e. low-P therefore under conditions of low deviatoric stresses.
- Here recrystallization occurs is near-static environment, and therefore it is lacks significance preferred mineral orientation.
- Many minerals are equidimensional, and elongate minerals that do form, are oriented randomly.
- Mono-mineralic with minor difference where the orientation dependence is low such as like in quartz or calcite, no preference faces are developed, results in granoblastic polygonal texture.
- Relict textures are common as there is little shear to destroy them.

Granoblastic fabric:

- Granoblastic fabrics is created under hydrostatic states of stress.
- Granoblastic fabric consists of an isotropic aggregate of equidimensional anhedral grains of more or less similar size. E.g. Quartzite & Marble.
- For granoblastic polygonal-When viewed under thin sections, the grains appear as equidimensional polygons with grain boundaries that meet at triple junctions at approximately 120°between them.

- This texture, also seen in poly-phase rocks, consists of an isotropic aggregate of polygonal grains of more or less similar size. In-equant grains, such as micas, are randomly oriented.

Hornfelsic fabric:

- A typical fabric developed in contact metamorphosed rocks such as pelites(shale, mudstone) or fine grained igneous rocks. These are fine grained rocks and lack foliation, are called as hornfels, a coarse grained hornfels is called as granofels. The rocks have been baked and indurated by heat of the intrusive magma usually granitic. E.g. Biotite Hornfels, calc-silicate-hornfels
- These are massive, hard, splintery and sometimes very tough and durable.
- Traces of bedding planes in parent rock may be retained.

How are these fabrics developed?

Recrystallization refers to solid-state production of new mineral grains from pre-existing ones. Two distinct processes are:

1. Recrystallization,(true sense) where boundaries of existing grains are texturally modified in some way. No new phases are created. Static heating can coarsen grain size whereas recrystallization of strained grains can yield smaller grains. An example of grain coarsening is seen in the conversion of limestone to marble
2. . Solid-state crystallization: Nucleation and growth of crystalline grains of a new phase or phases are stabilized by changing metamorphic conditions, such as formation of white mica and chlorite from illite and smectite in the shale to slate transition.

   Once nuclei of the new phase or phases are viable, requisite ions for grain growth diffuse from nearby decomposing unstable, or reacting, mineral grains.

   Some sort of intergranular fluid is commonly involved in the mineral reaction.

ROCKS IN CONTACT AUREOLES

Hornfels = Massive, fine grained, sugary textured rocks, very tough;

Can have many protoliths (pelitic, felsic volcanic common) • No compositional meaning to hornfels • Can have large crystals growing within • Not the exclusive rock at contact aureole

(Note)Depends on character of emplacement: Forceful intrusion produces strongly foliated and lineated rocks, results in contact gneisses and schists