

DSPMU UNIVERSITY, RANCHI.

DEPARTMENT OF GEOLOGY

SEMESTER-IV

PAPER CODE- GLGC408

DATE-16/04/2020

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INDEX MINERALS

As rocks are subjected to increasing or decreasing heat and pressure, they undergo the process of metamorphism (change in texture and/or composition). Thus different minerals appear in any given rock depending upon the type of rock and the amount of heat and pressure the rock undergoes.

By studying the minerals in rocks it help us to determine how much heat and pressure — and thus how much metamorphism the rock has undergone.

Certain minerals, called "index minerals," only appear in certain rocks at certain pressure-temperature conditions, Thus, these minerals (index minerals) can tell geologists how much the rock has metamorphosed. Eg: chlorite, epidote, garnet, staurolite, kyanite, sillimanite etc.

Some common Index minerals in metamorphic rocks are shown in Figure-1 below arranged in order of the temperature ranges within which they tend to be stable. The upper and lower limits of the ranges are intentionally vague because these limits depend on a number of different factors, such as the pressure, the amount of water present, and the overall composition of the rock. Even though the limits of the stability ranges are vague, the stability range of each mineral is still small enough that the minerals can be used as markers for those metamorphic conditions.

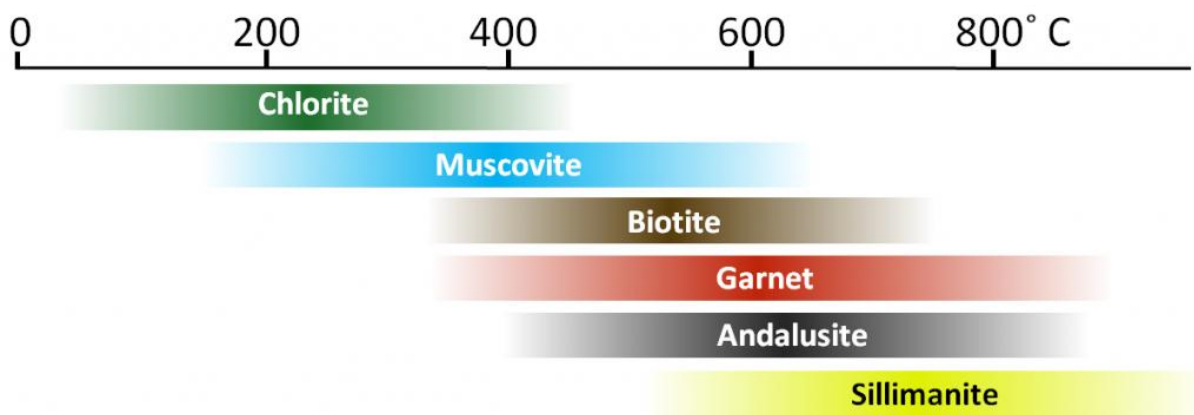


Figure 1-Metamorphic index minerals and approximate temperature ranges.

A simple example can be seen in figure-2 which shows the progressive metamorphism of Shale to slate and then to phyllite. After phyllite, Schist is next to form, and then gneiss when high-grade metamorphism is reached. Beyond 800°C, the rock may completely deform by melting.

Note how the index minerals change with increasing grade of metamorphism from one rock type to another. Chlorite and muscovite form at relatively low temperatures. Garnet forms at higher temperatures and pressures. Sillimanite indicates the highest level of temperatures and pressures.

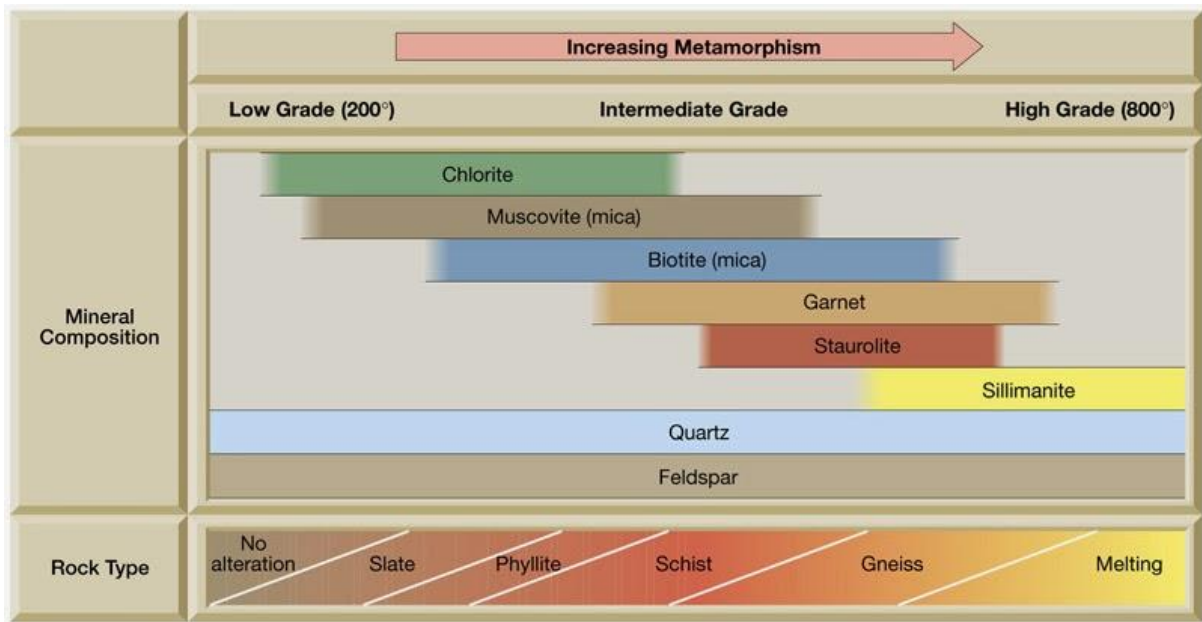


Figure 2- progressive metamorphism of Shale.