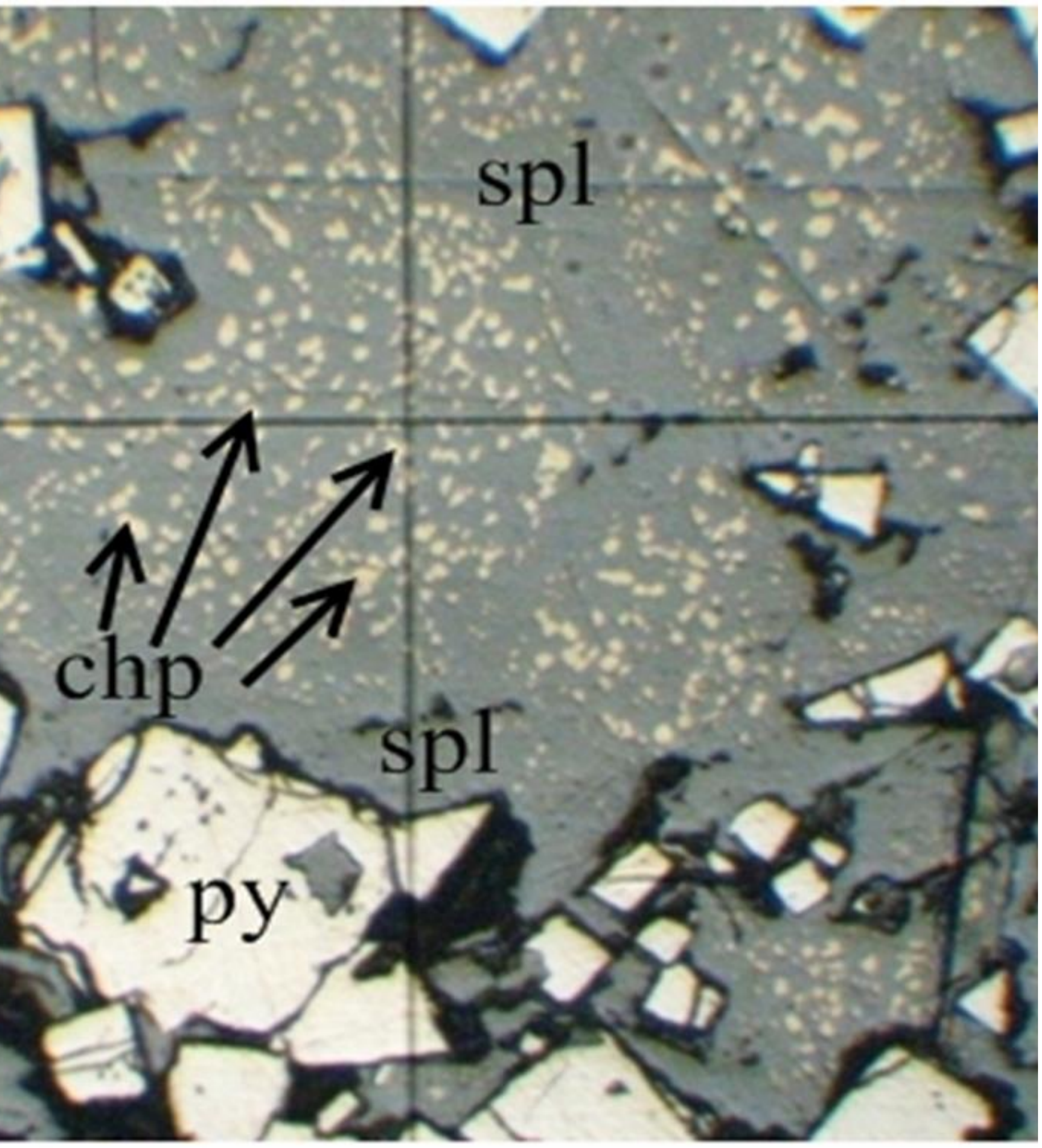

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FEATURES OF CRYSTAL MORPHOLOGY OF NATURAL MINERALS

GRAIN SHAPE, ACCRETIONS AND INCLUSIONS OF MINERALS

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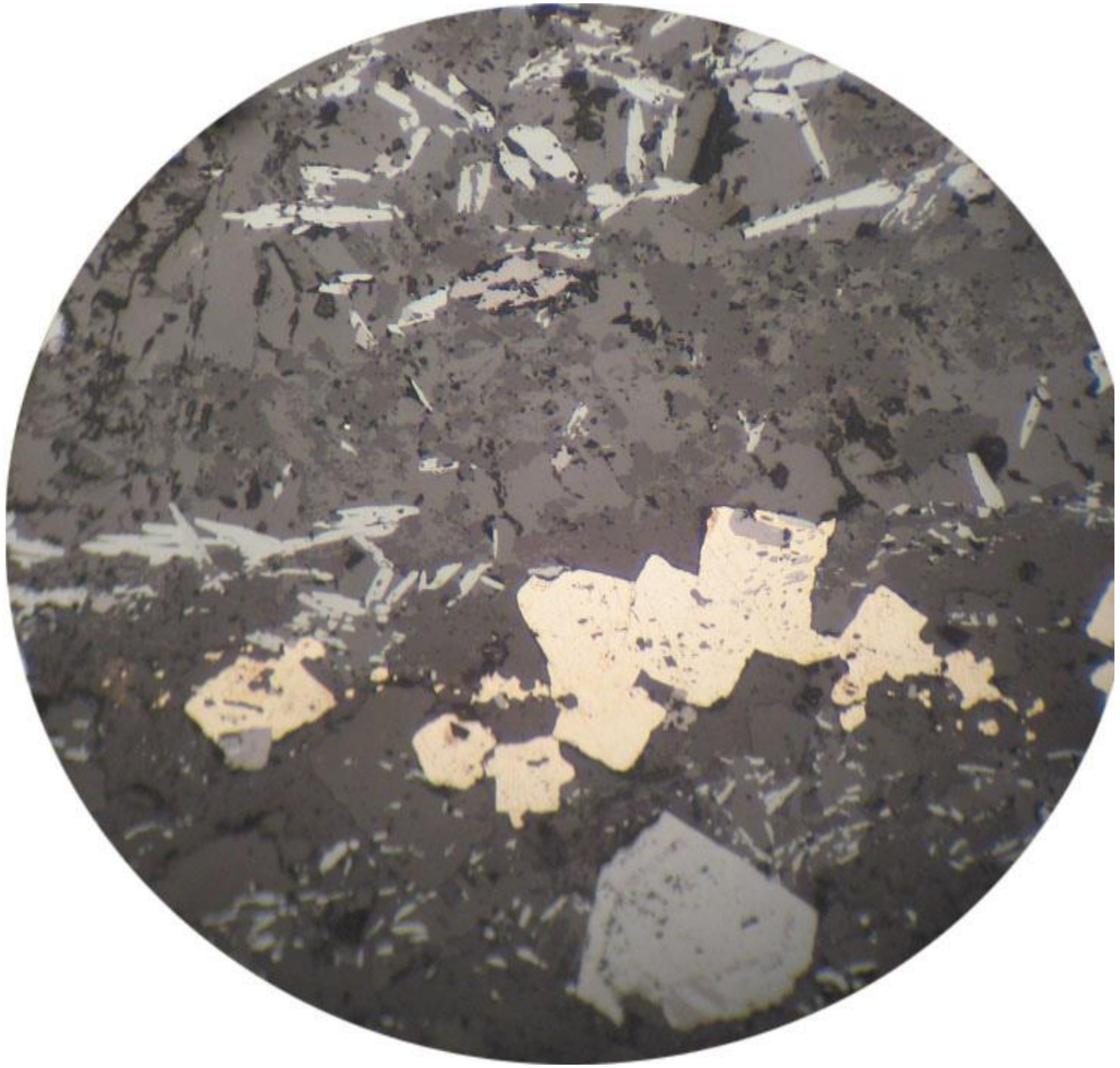
YEVHENIIA DEMENTIEVA

SHAPE AND HABITUS OF CRYSTALS

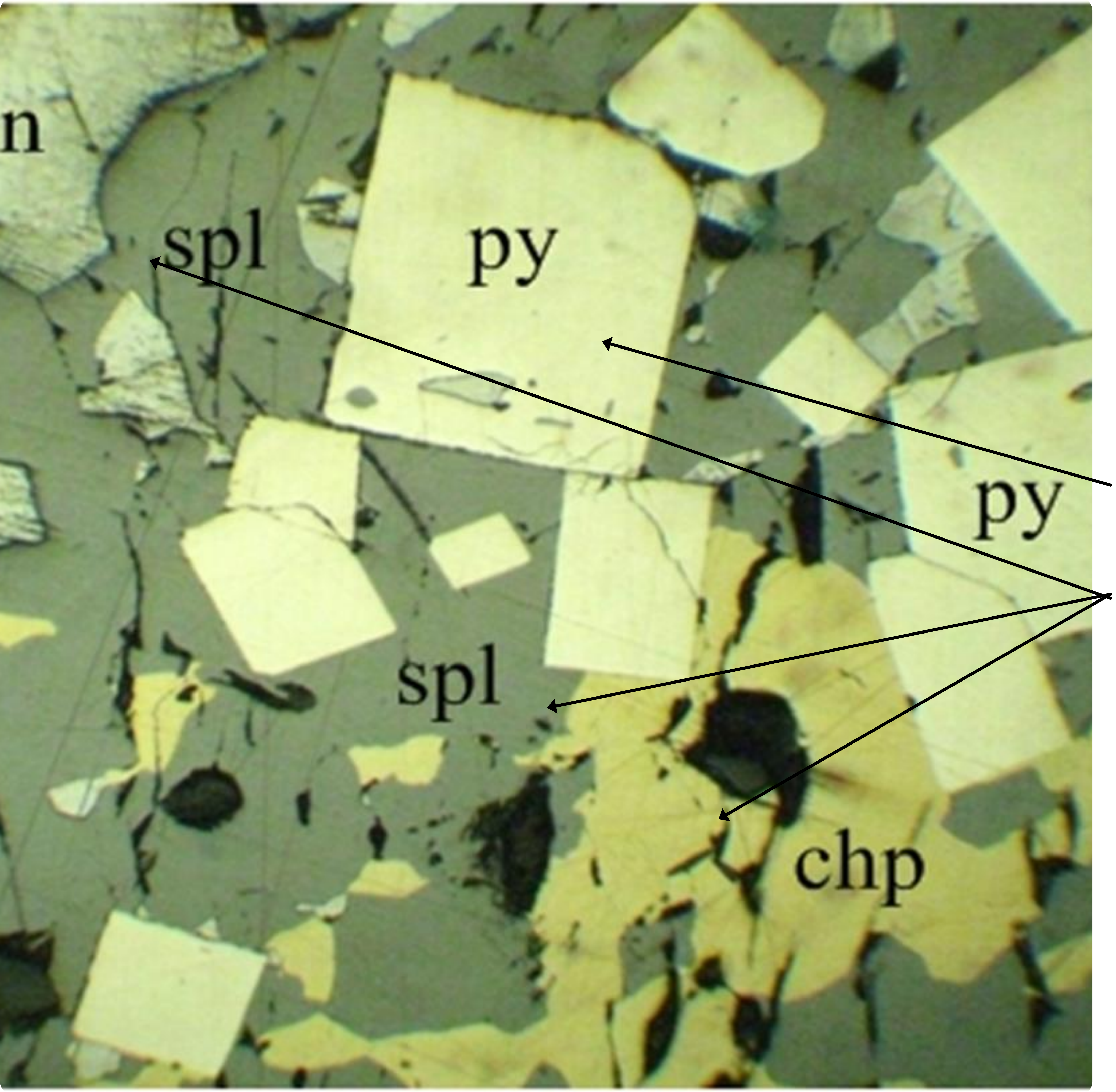


Virtually all crystalline forms of minerals studied in thin sections and specimens are also found in polished sections.

Minerals with high hardness, characterized by a significant crystallization force, tend to develop well-formed crystals, even under the least favorable conditions. Such crystal shapes are called ***euhedral or idiomorphic***, and are typical for the following minerals: pyrite, arsenopyrite, magnetite, hematite, tungstenite, etc.

Minerals with incompletely developed crystal faces are called ***hypidiomorphic***.

Some minerals are characterised by ***anhedral*** forms (chalcopyrite, bornite, tetrahedrite). The configuration of such minerals *(allotriomorphic or xenomorphic)* depends on the shape of the space to be filled.

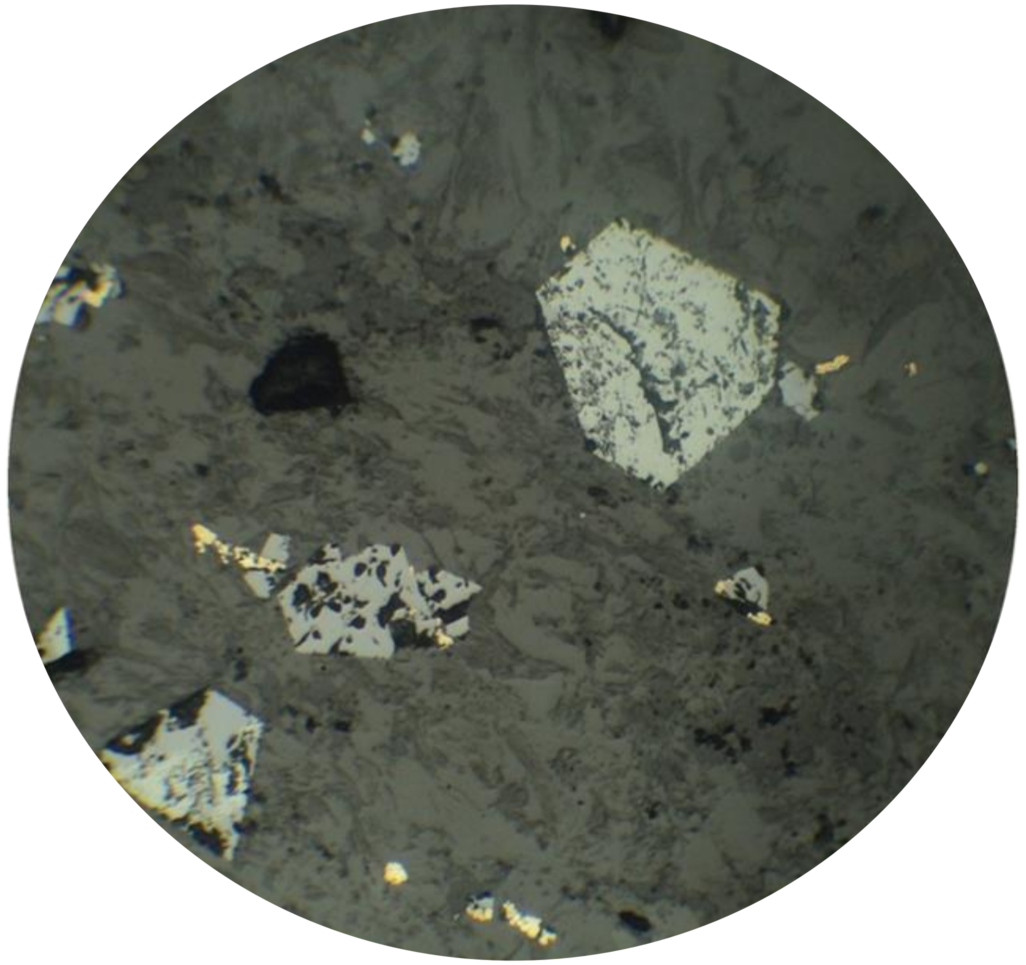


MORPHOLOGICAL FEATURES OF ORE MINERALS:

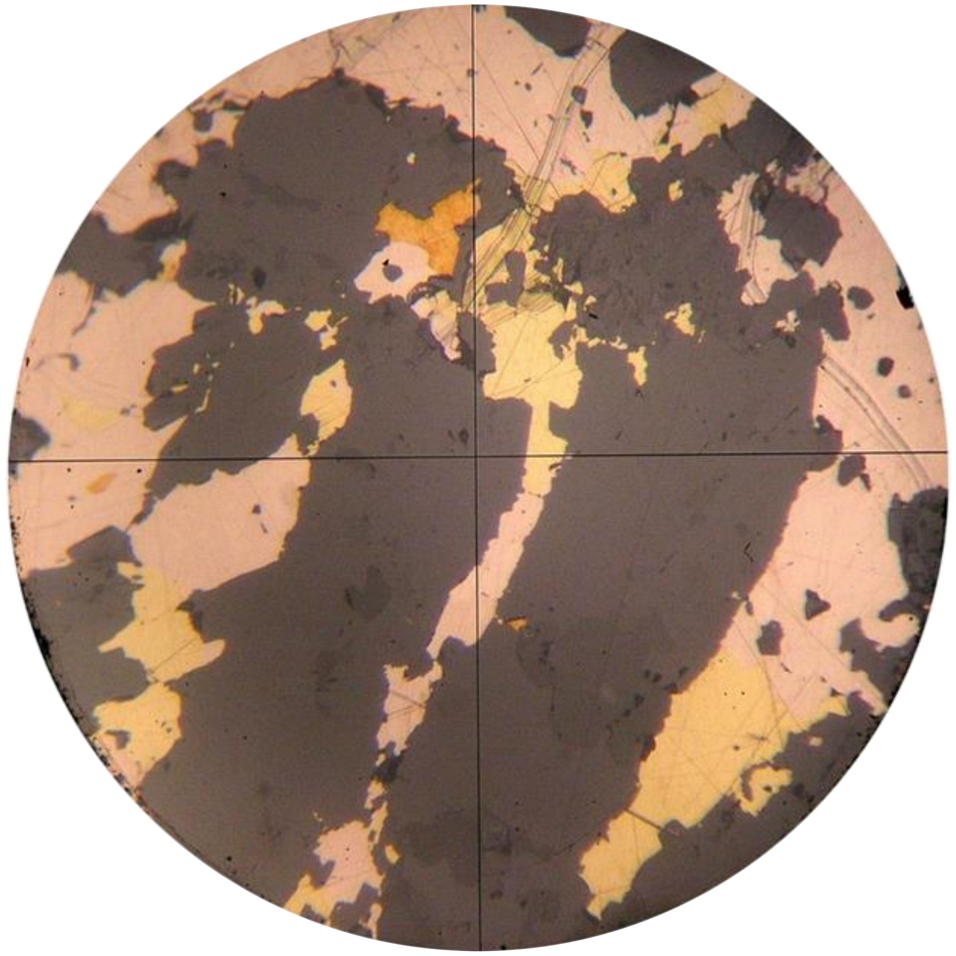
Panidiomorphic – pyrite

Allotriomorphic – sphalerite
chalcopyrite, galena

OCTAHEDRAL MAGNETITE AND ALLOTROPOMORPHIC PYRITE, CHALCOPYRITE AND PYRRHOTITE

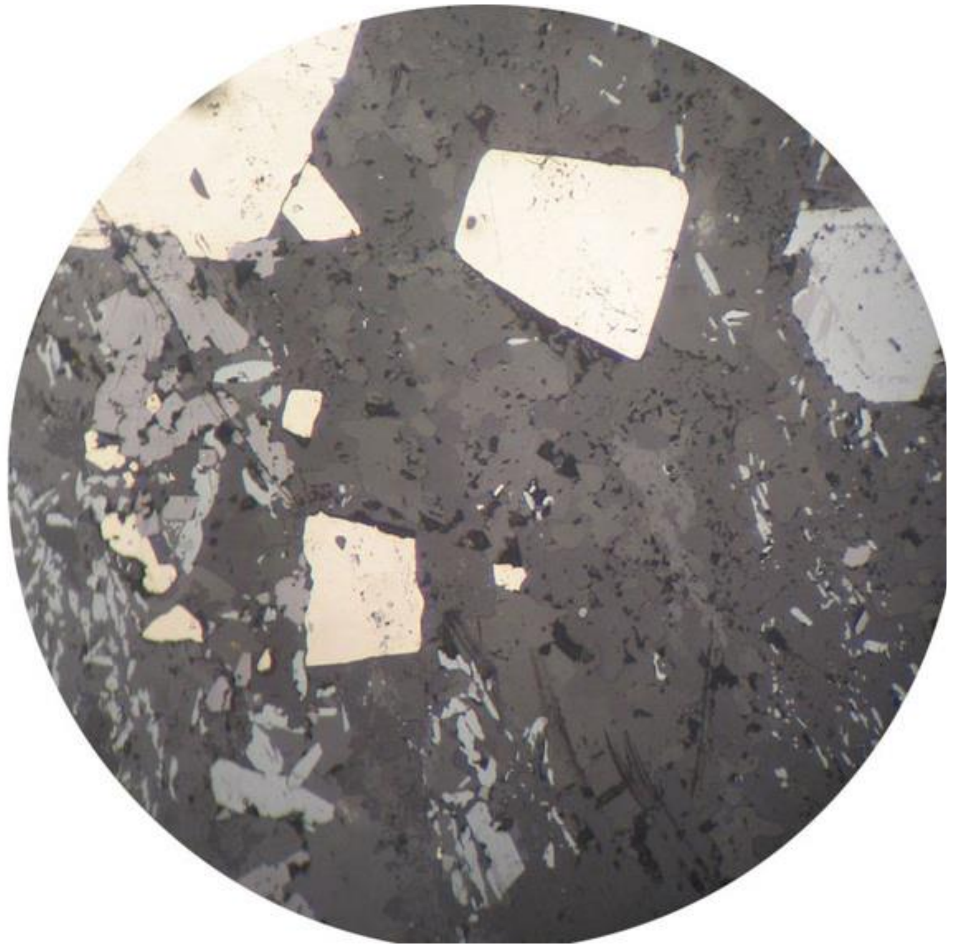


Panidiomorphic – octahedral magnetite



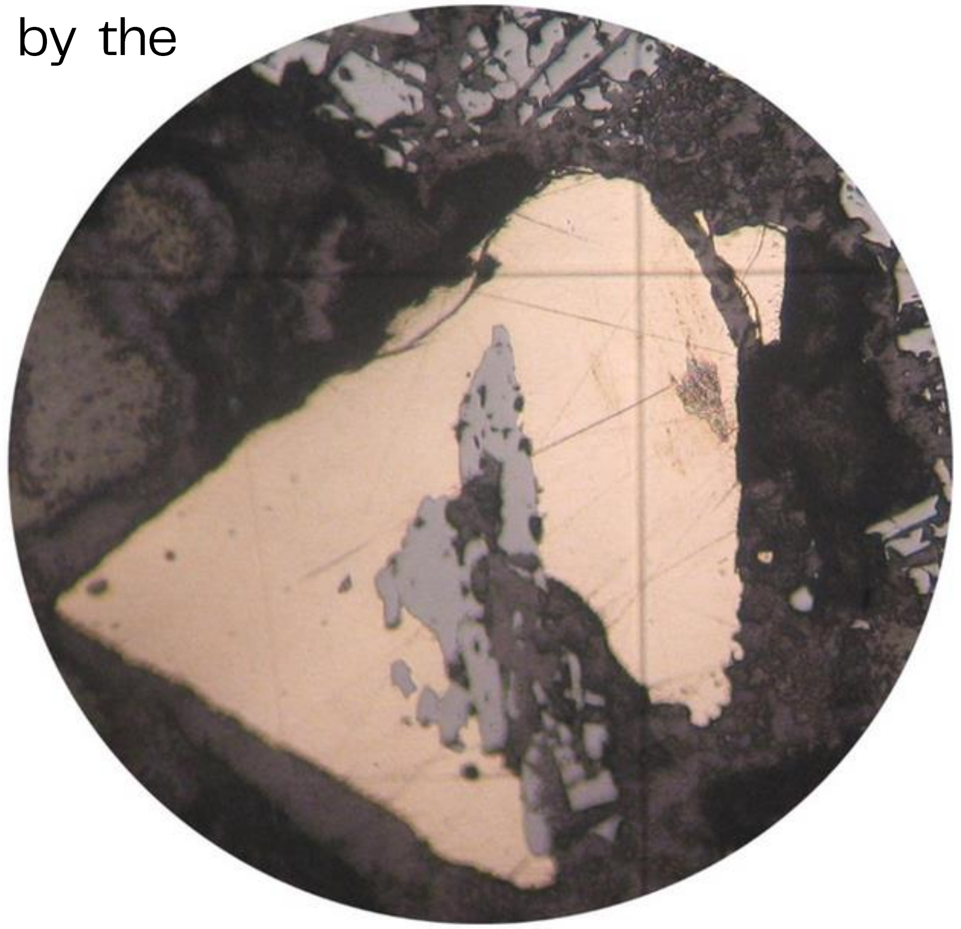
Allotropomorphic – pyrite, chalcopyrite and pyrrhotite

GRAIN SHAPE IN THE POLISHED SECTION



The polished surface of the polished section allows you to create a two-dimensional representation of a three-dimensional object.

The shape of a crystal cross-section depends on the random position in which the crystal was cut by the grinding surface.



As a result, for example, different cross-sections of a cube in an anschlief can have the shape of a square, rectangle, or triangle.

The true crystal shape of a mineral is determined by observing several cross-sections of the crystal under study.

EXAMPLES OF CRYSTAL HABITUSES OF ORE MINERALS:

Almost all mineralogical terms used to characterize the habitus of crystals in mineralogical studies can be used in ore microscopy
(cubic, octahedral, tabular, columnar, elongated-plate, prismatic, colloidal).

The habitus of crystals can be used in the diagnosis of vein minerals, which are usually associated with metallic ones.

Needle – hematite, antimonite, jemsonite, rutile;

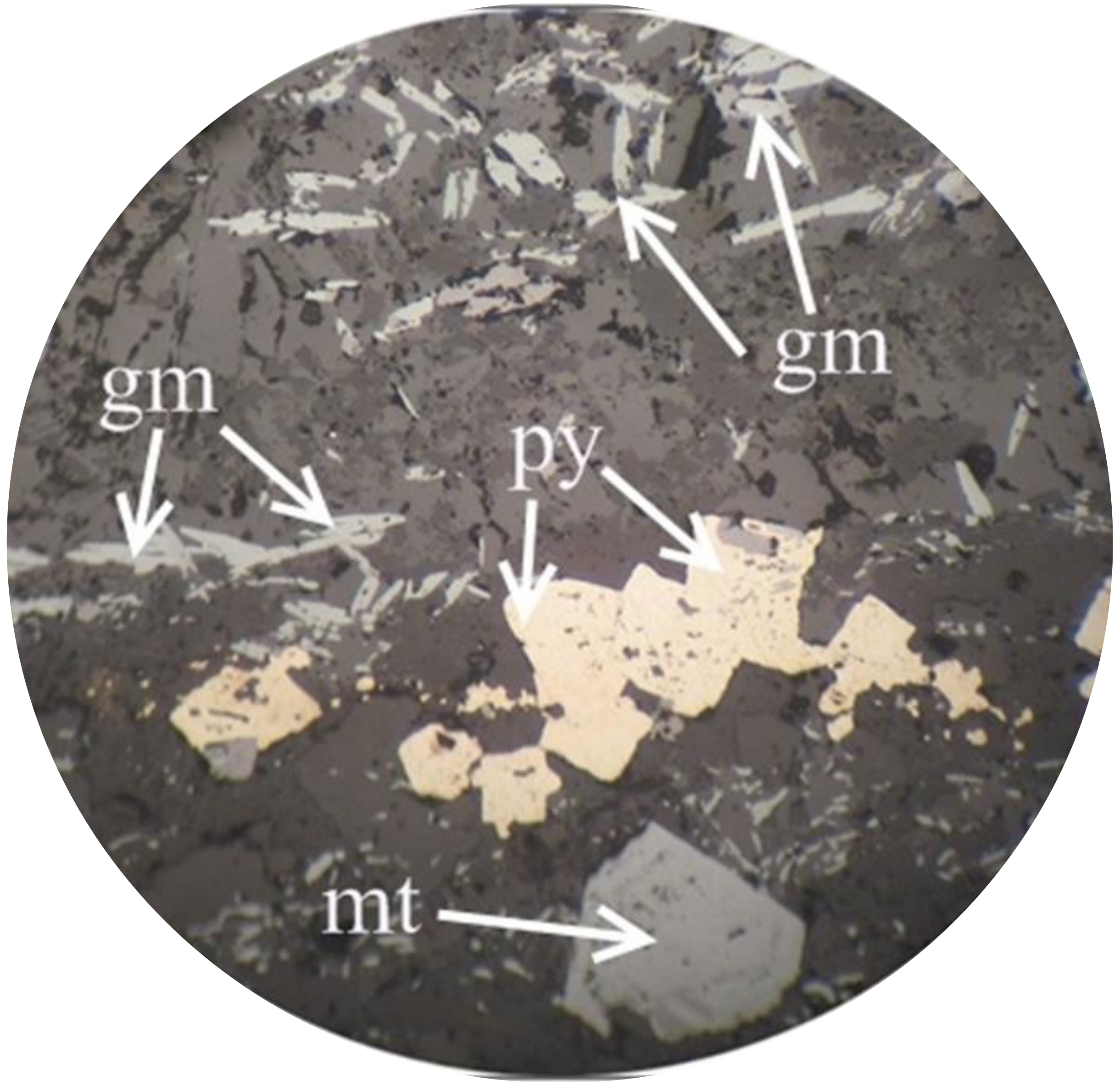
Blasto-grain – ilmenite, hematite

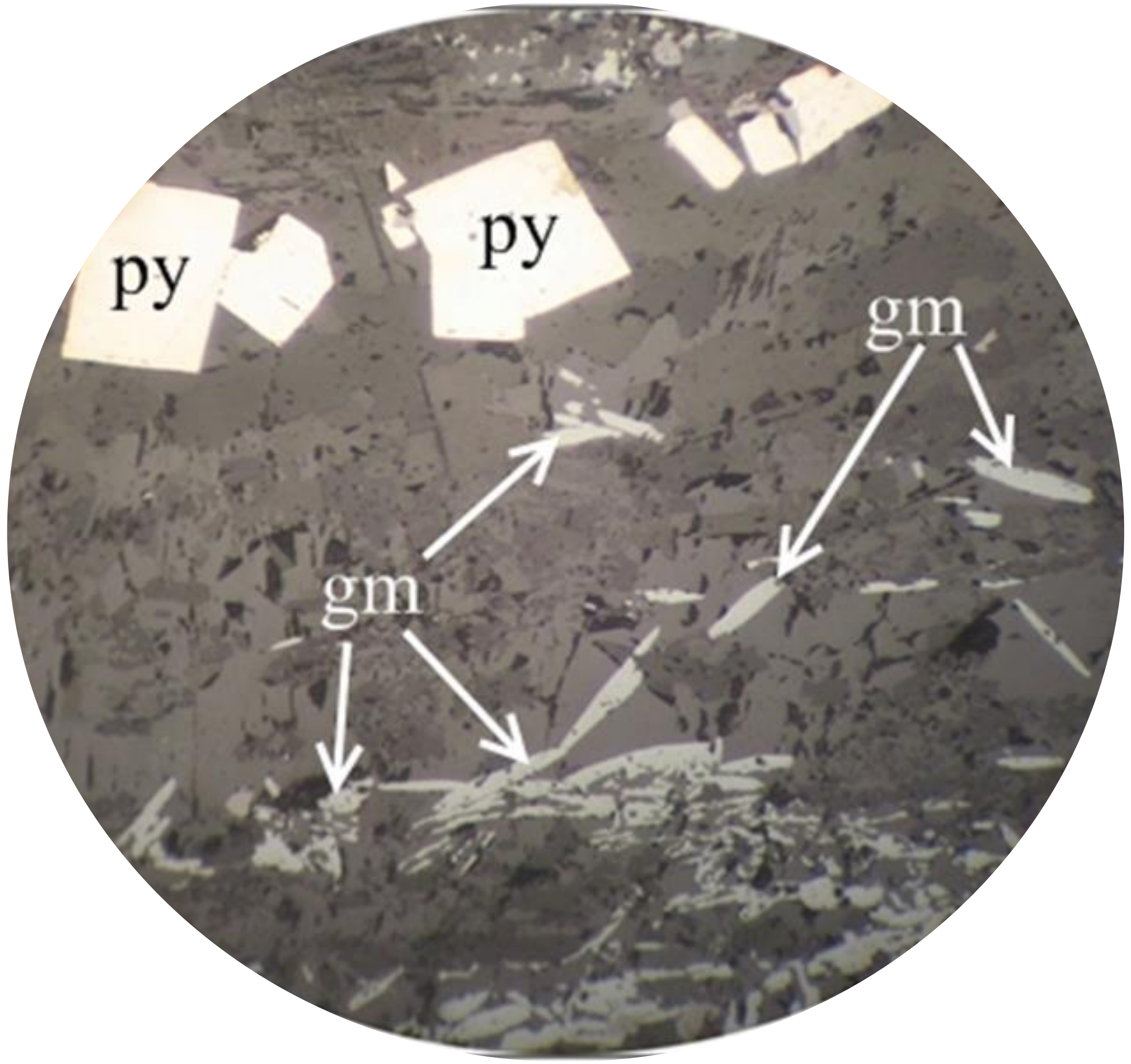
tabular – covellite,, graphite, hematite, molybdenite

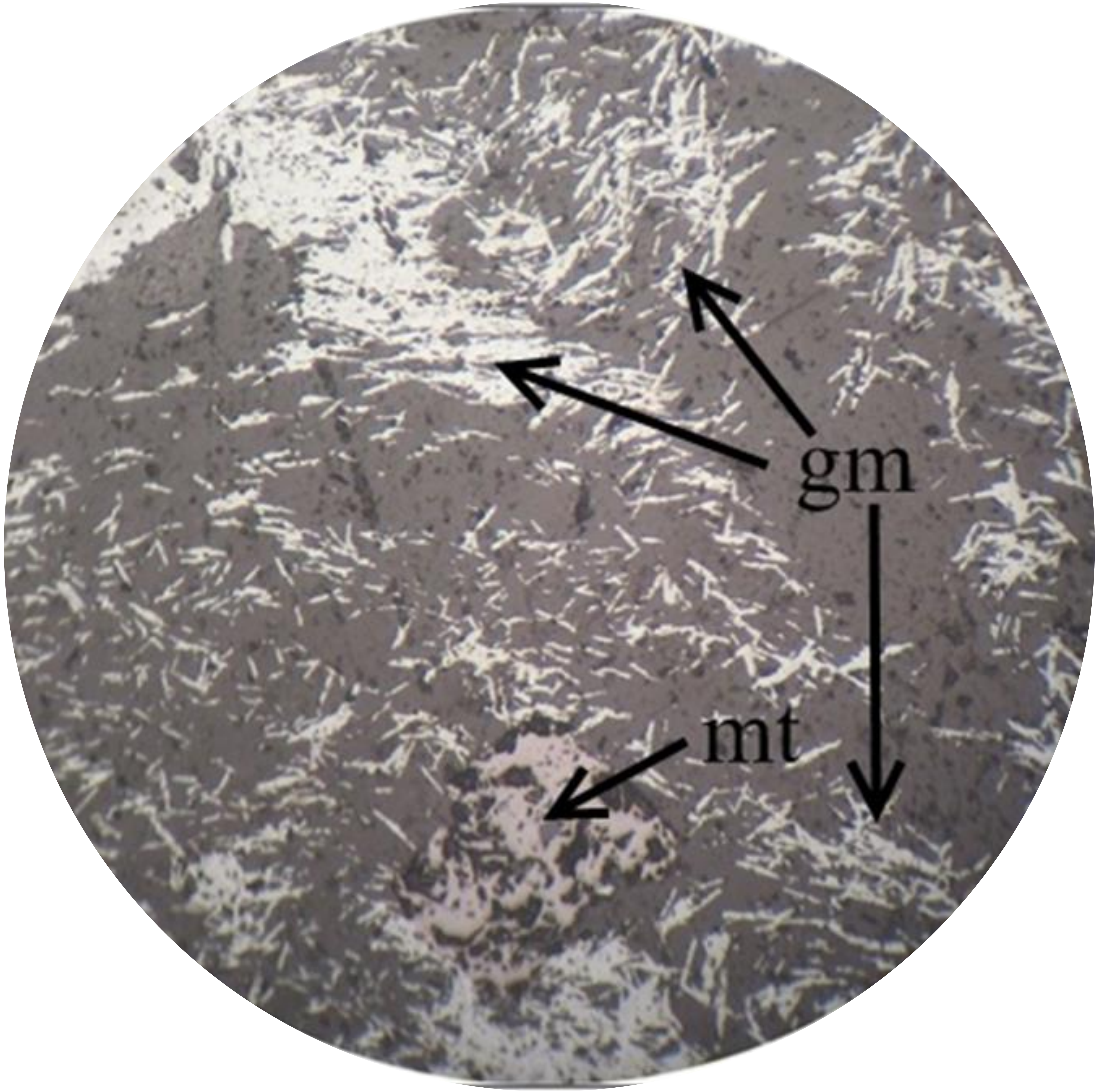
rhombic – arsenopyrite, marcasite

skeletal – magnetite (due to rapid crystallization).

ASSOCIATION OF HEMATITE NEEDLE GRAINS, OCTAHEDRAL MAGNETITE, CUBIC PYRITE

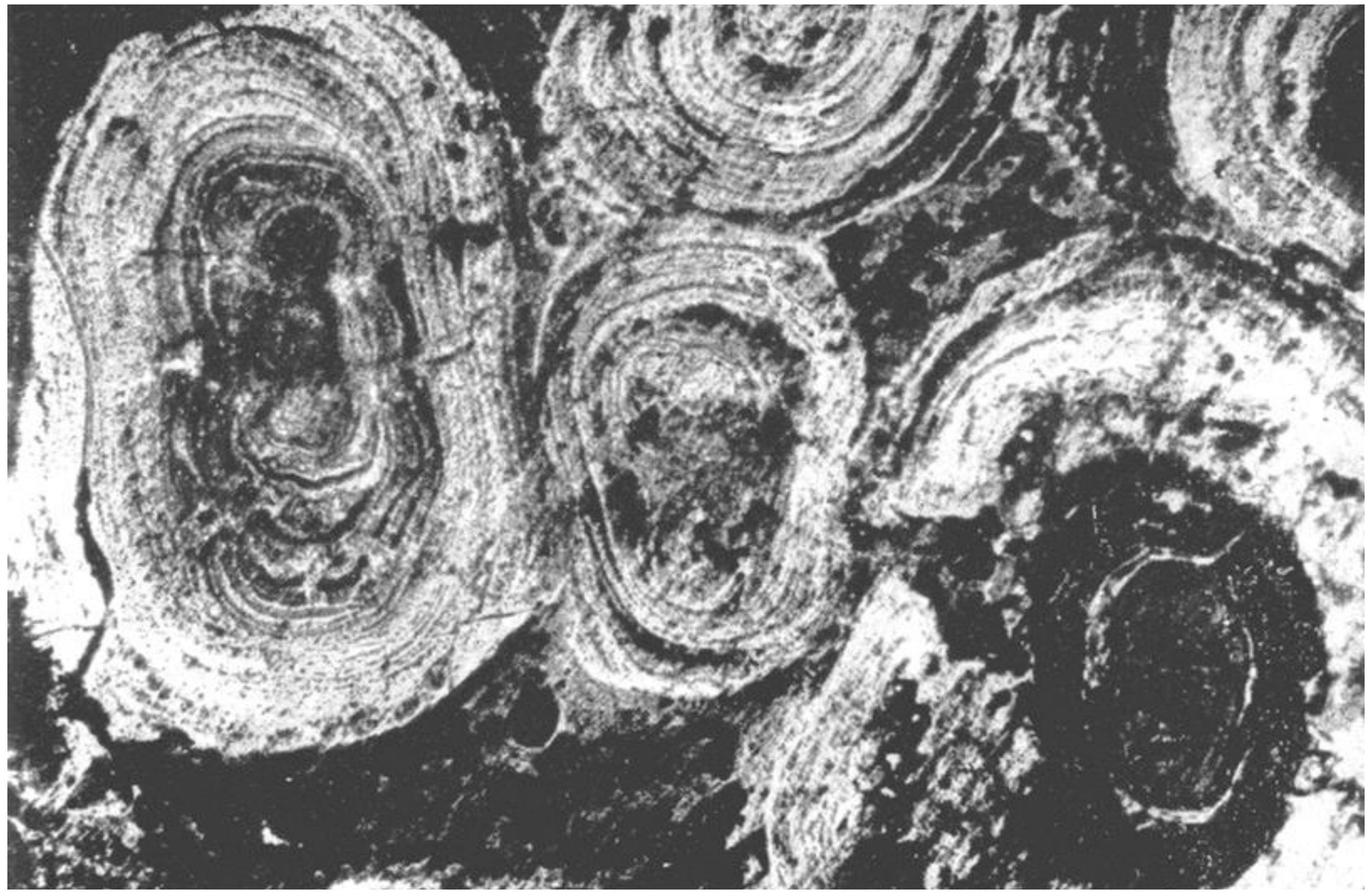


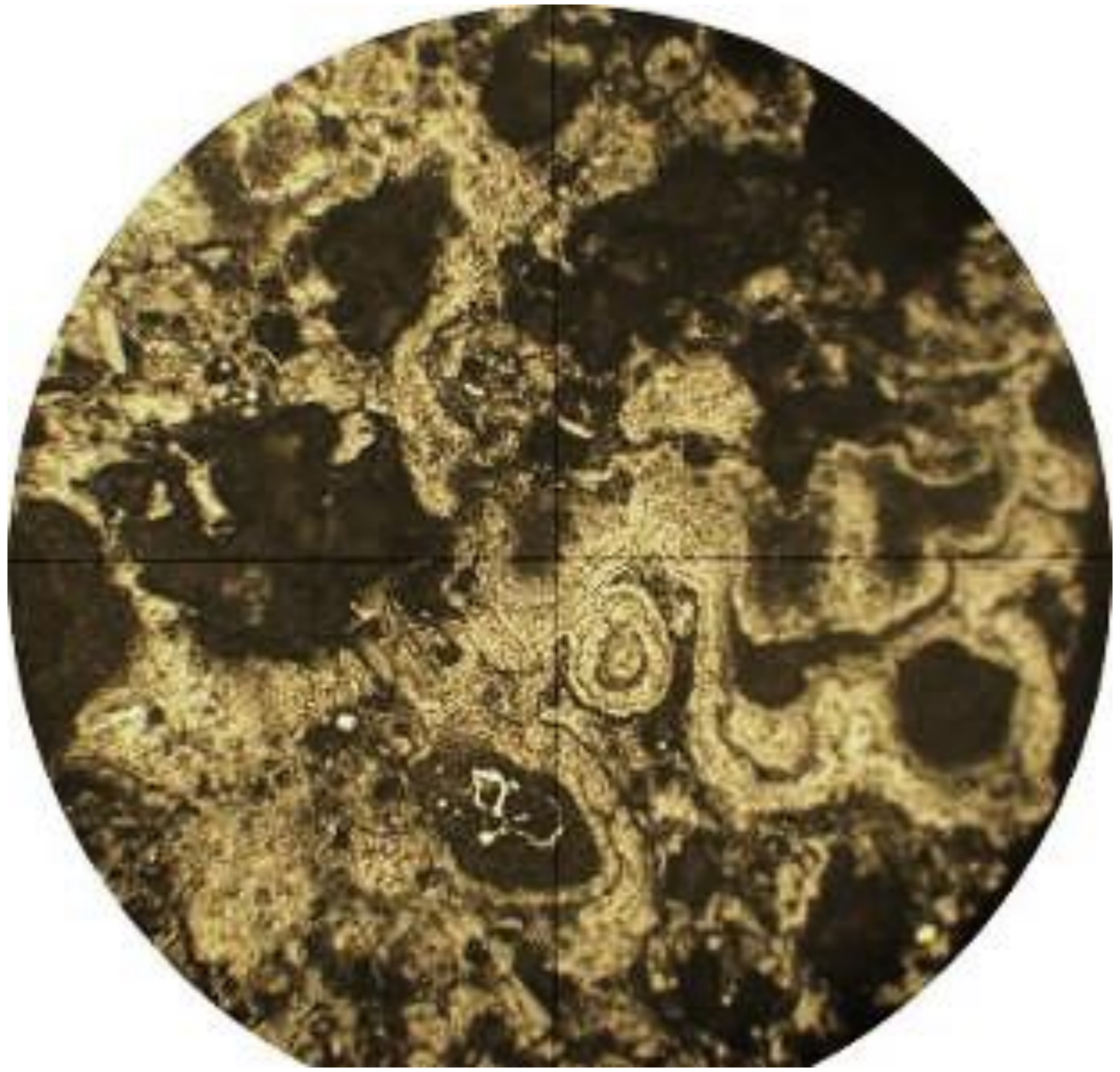




METACRYSTAL OF MAGNETITE AND IDIOMORPHIC GRAINS OF FERRUGINOUS MICA

COLOMORPHIC-ZONAL AGGREGATES OF GOETHITE AND HYDROGETHITE IN IRON ORE OF THE WEATHERING ZONE





MINERAL GRAINS, CRYSTALLIZATION CAPACITY AND GROWTH FORCE, LINEAR RATE

Crystalline grain **is mineral formations that have formed during crystallisation from solutions or melts.**

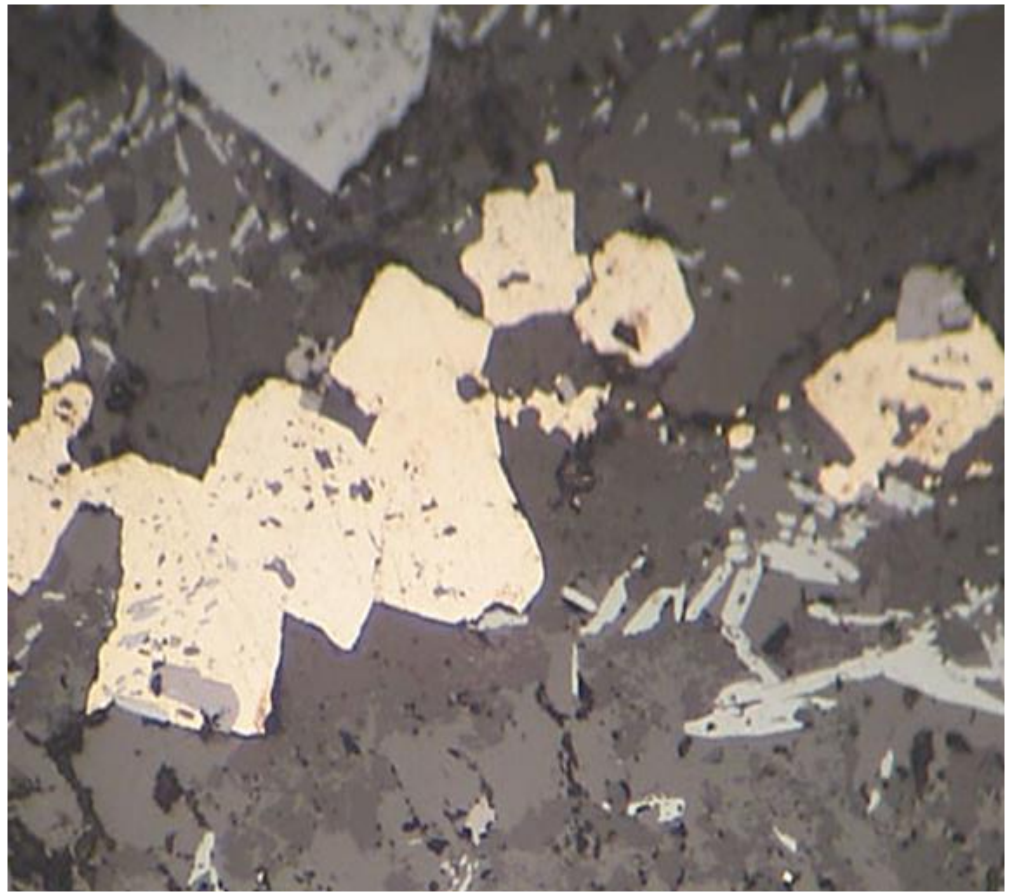
Metagrain is a mineral formation that has formed during the process of metasomatism.

Colloidal formations **are mineral formations that form during the coagulation of colloidal solutions.**

Blasto-grain is a mineral formation that forms during the recrystallisation of grains and the recrystallisation of colloids.

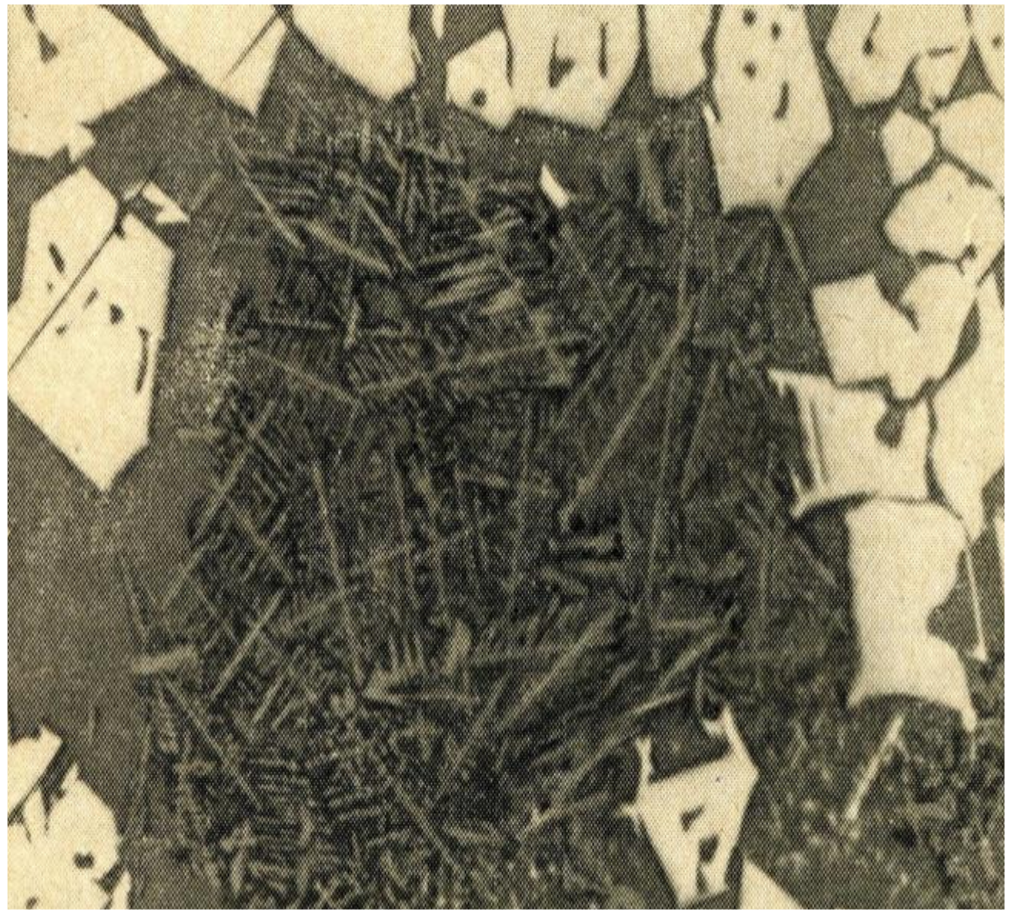
The form of mineral secretions formed during the crystallization of melts or solutions depends on the crystallization capacity of the substance, the linear rate and force of crystallization growth of minerals.
The onset of crystallization is the moment in the state of a melt or solution when crystallization centers appear in it.
The crystallization capacity is the property of a substance to form a certain number of crystallization centers per unit time.
The higher the crystallization capacity of a substance, the finer the aggregate is formed.

The crystallization rate is the linear rate of crystal growth per unit time. The higher the crystallization rate, the less ideal crystal shapes will form.



At a low crystallization rate, crystals of regular shape and uniform size are formed.

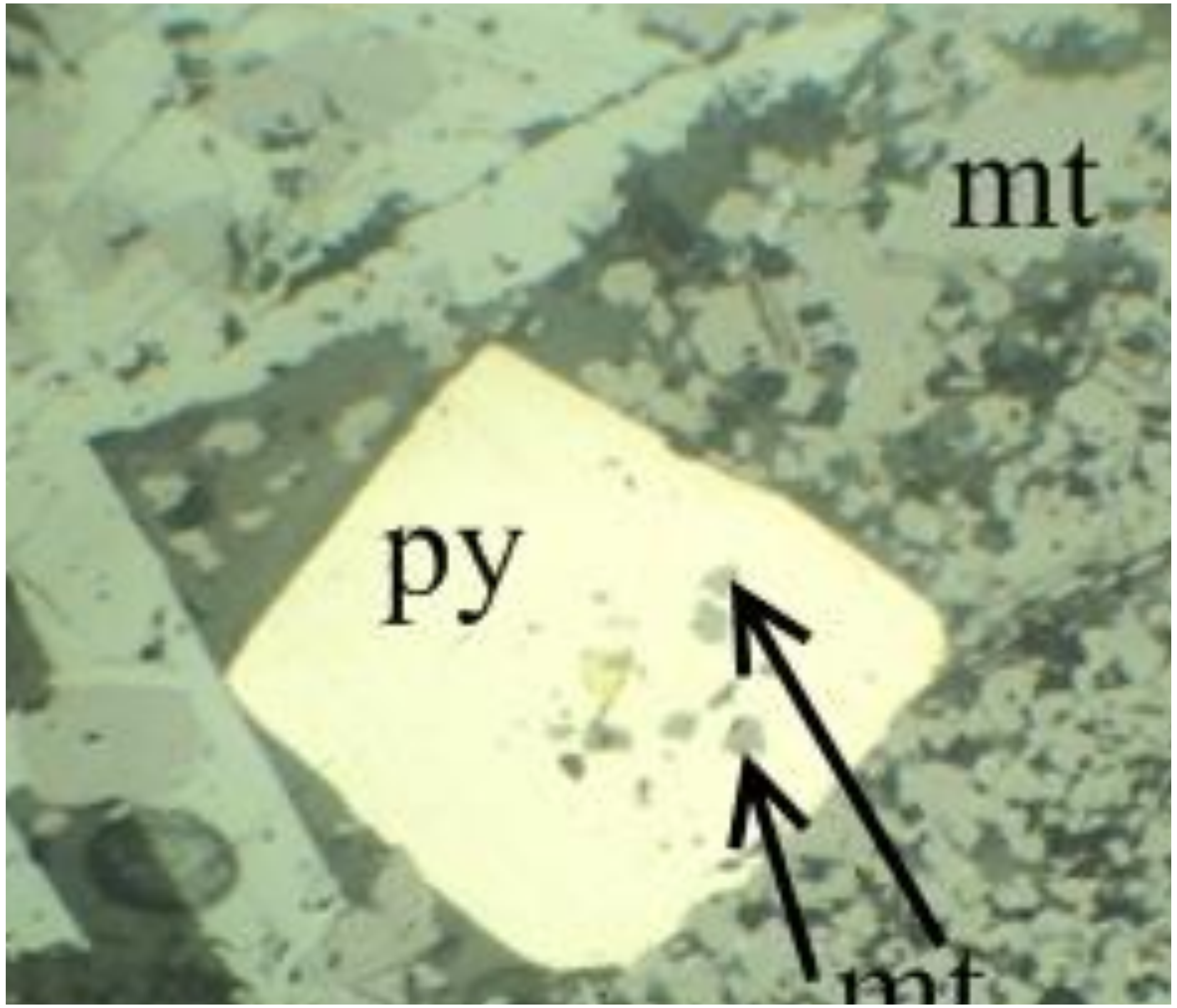
If the crystal growth rate is the same in all directions,
isometric crystal grains are formed.

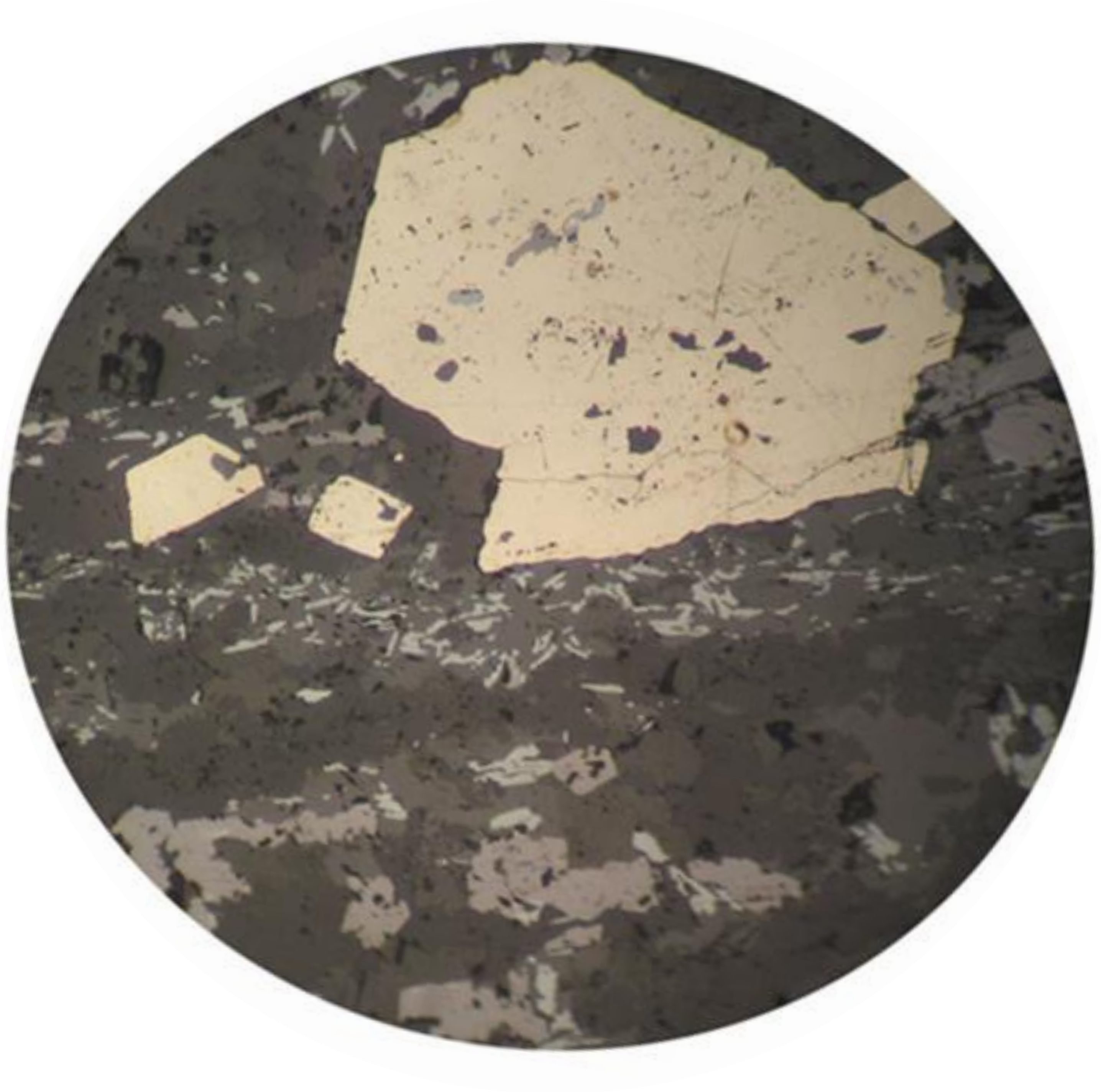


If the crystal growth rate is vectoral, needle-like and lamellar grains are formed.

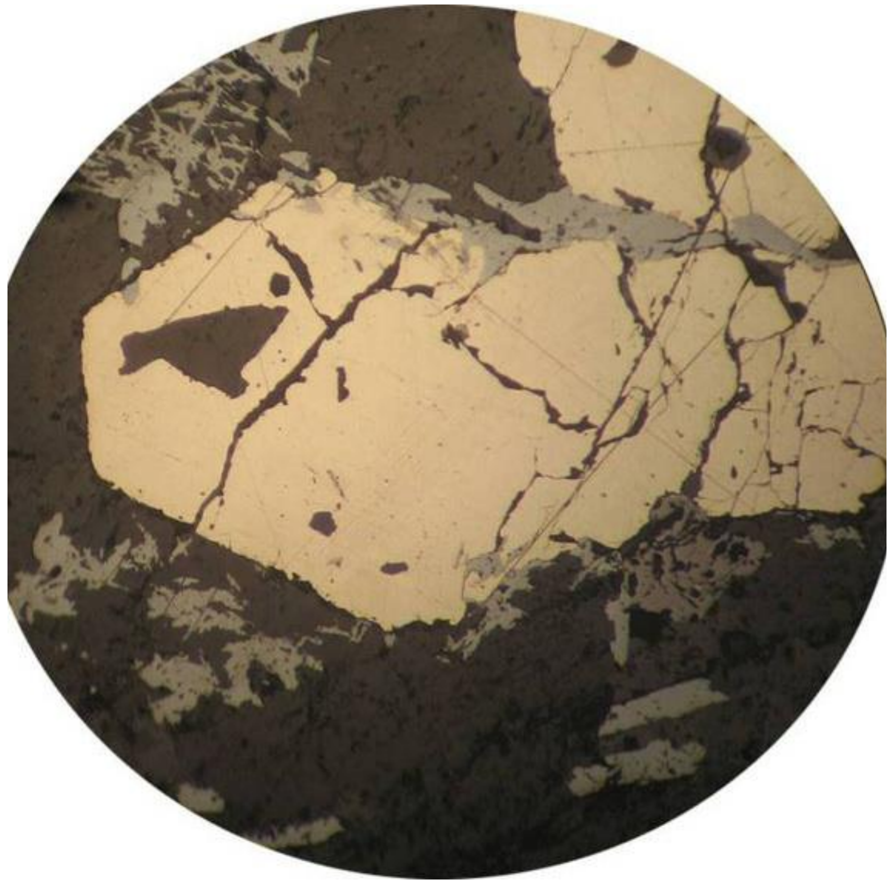
METACRYSTALS

If the replacement mineral takes on its characteristic crystallographic shape, it is called a metacrystal

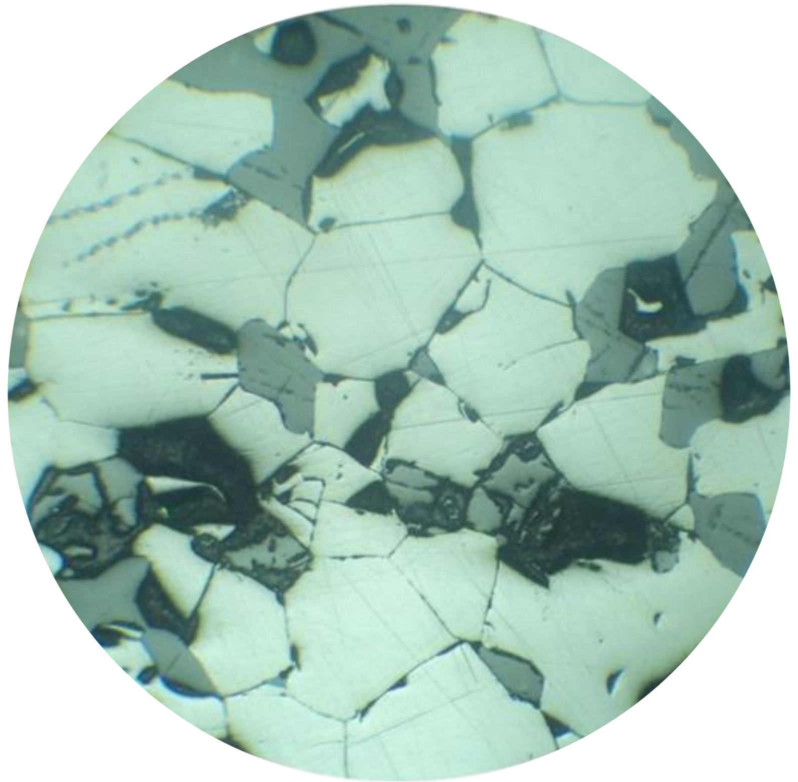




BLASTOGRAINS.
THE PROCESS OF CREATION.



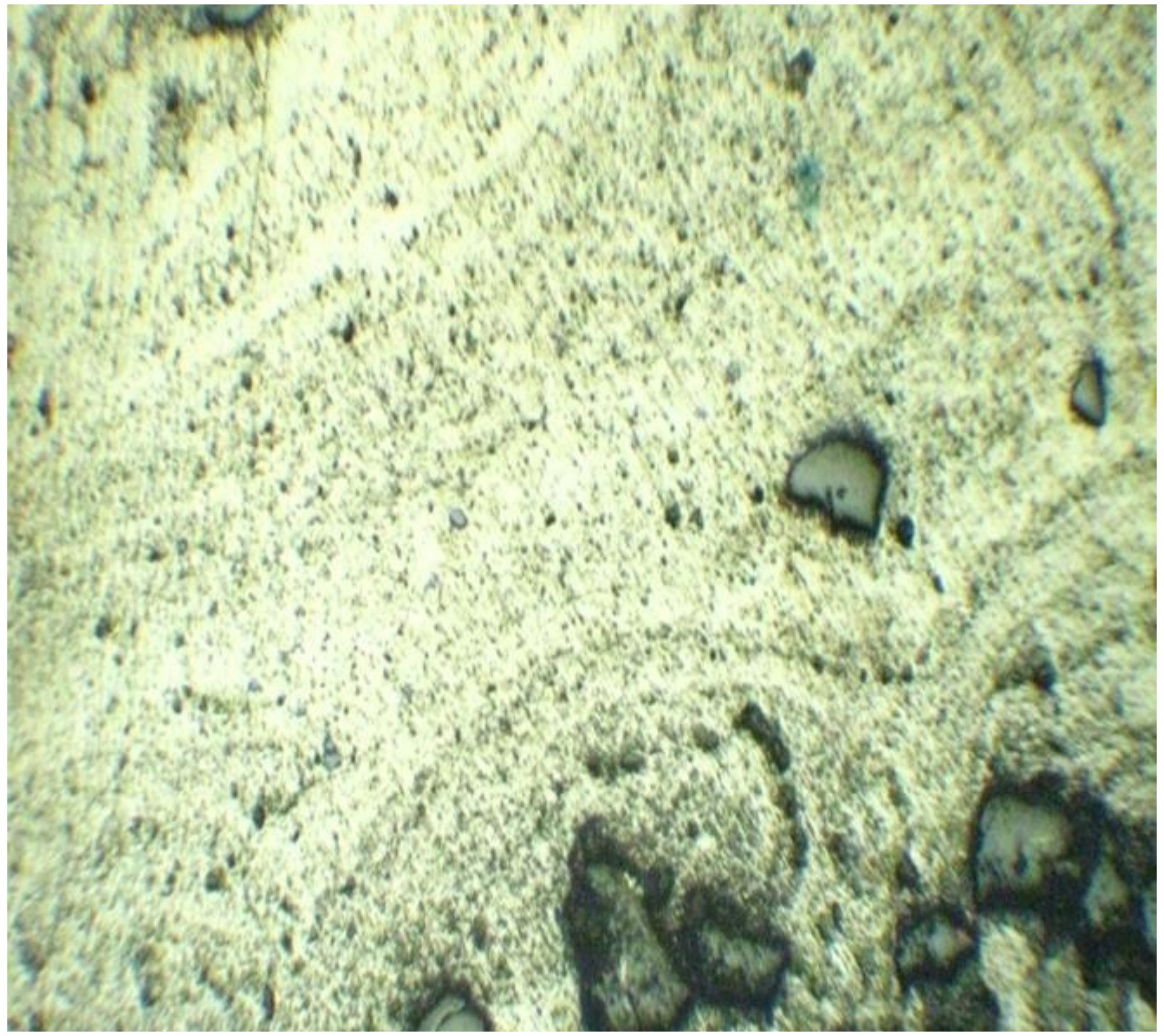
The process of formation of mineral grains during recrystallization occurred in the solid state, so the newly formed grains are called blastograins or blasts. Depending on the strength of crystallization growth of minerals, blastograins can have idiomorphic, hypidiomorphic, and allotriomorphic outlines.

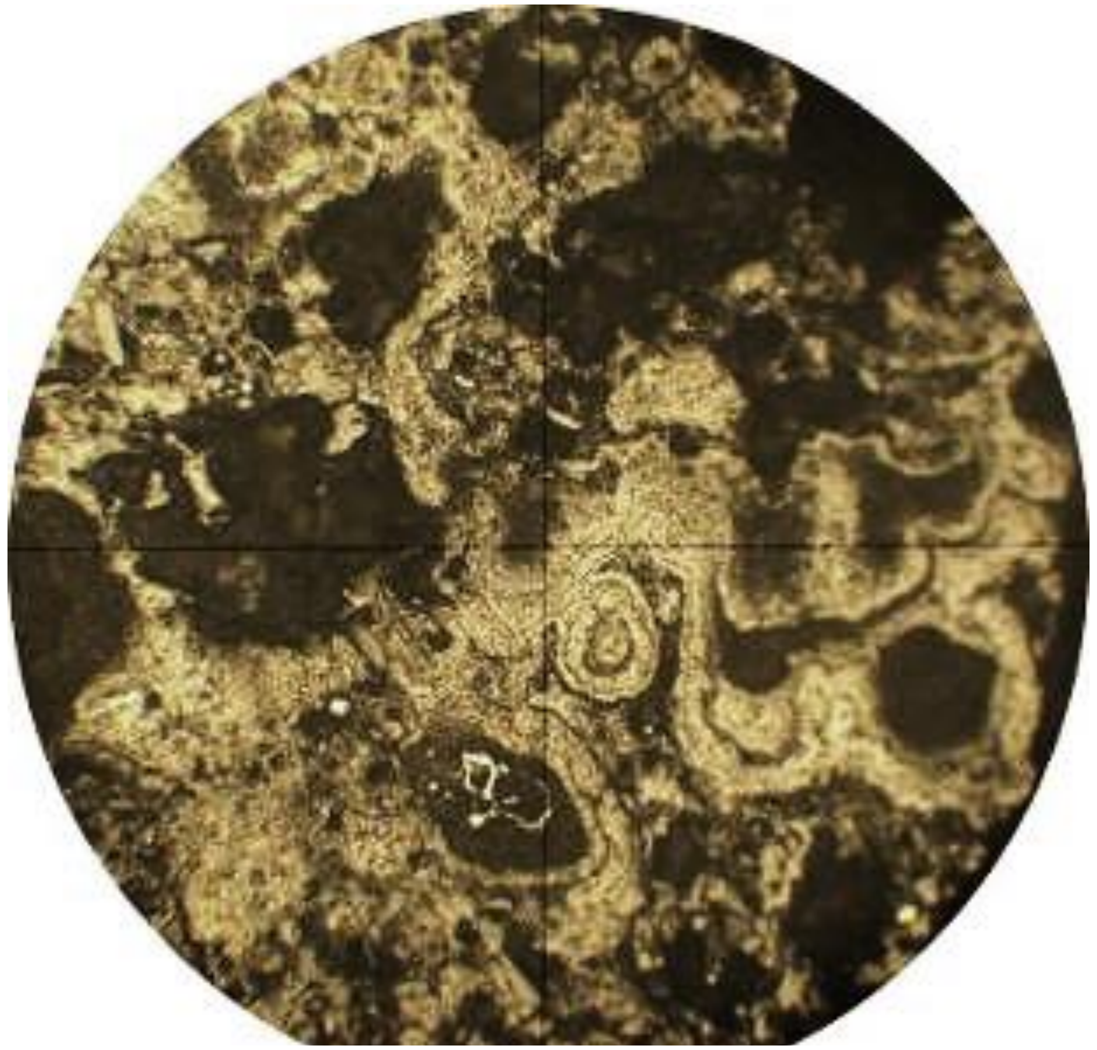


A characteristic feature of blasto-grains in a mineral aggregate formed as a result of recrystallization and recrystallization of a substance is smooth intergranular boundaries without signs of corrosion.

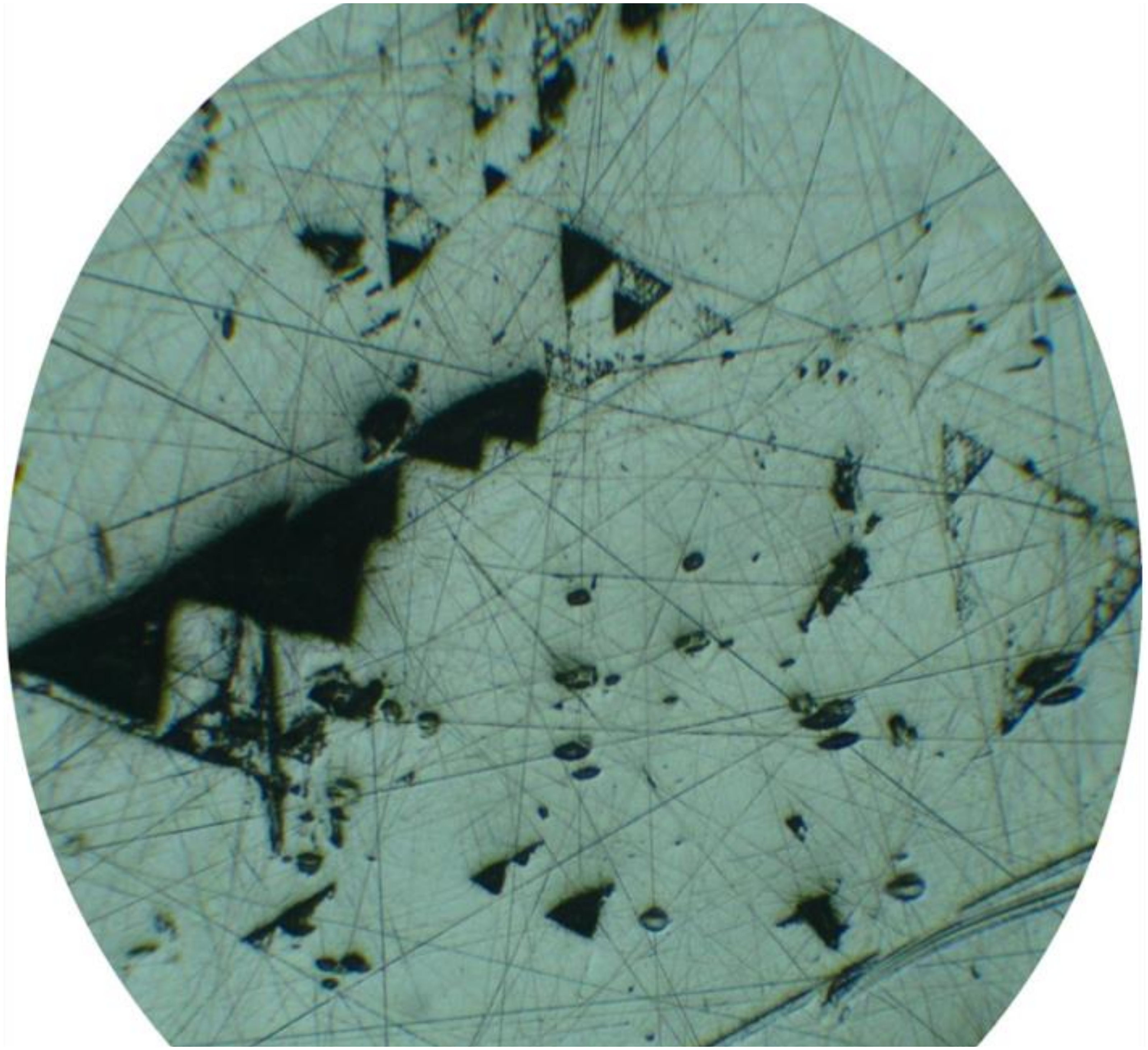
COLLOIDAL FORMATIONS AND MICROTEXTURE

The form of mineral formations of colloidal origin is characterized by a dispersed particle size of 10^{-5} to 10^{-7} mm. A characteristic feature of such formations is their hidden crystalline structure.





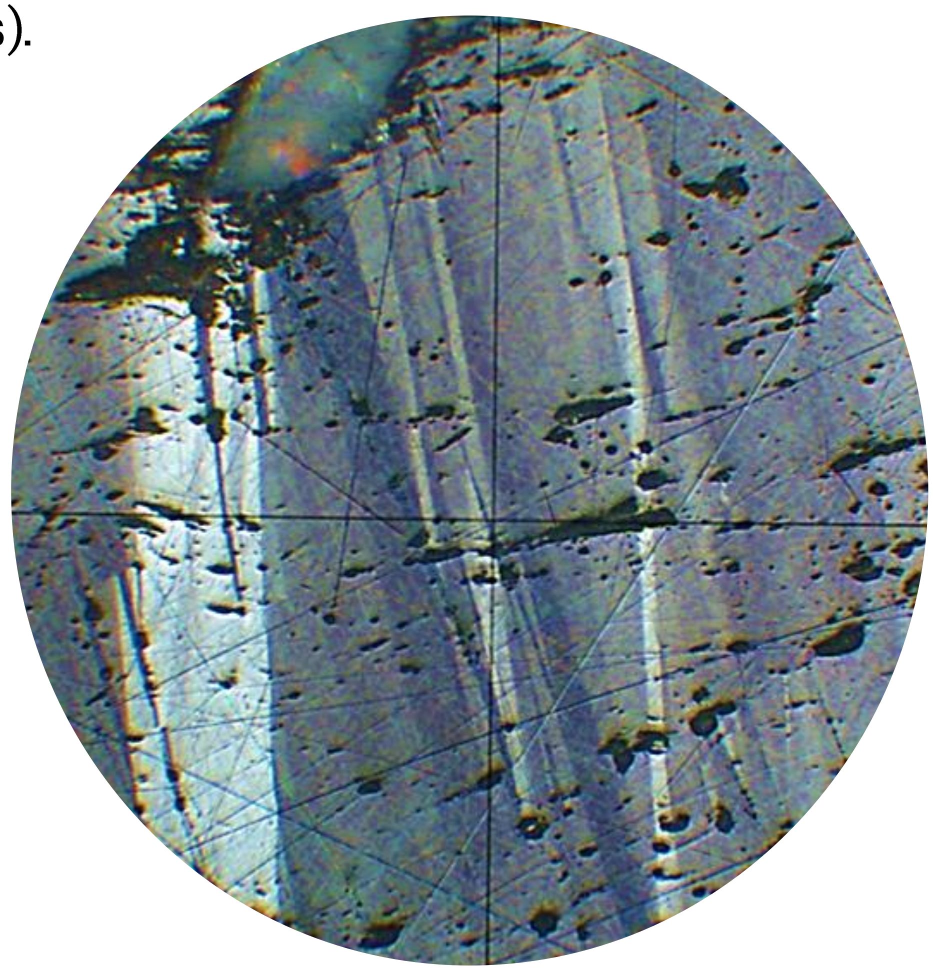
CLEAVAGE OF MINERALS



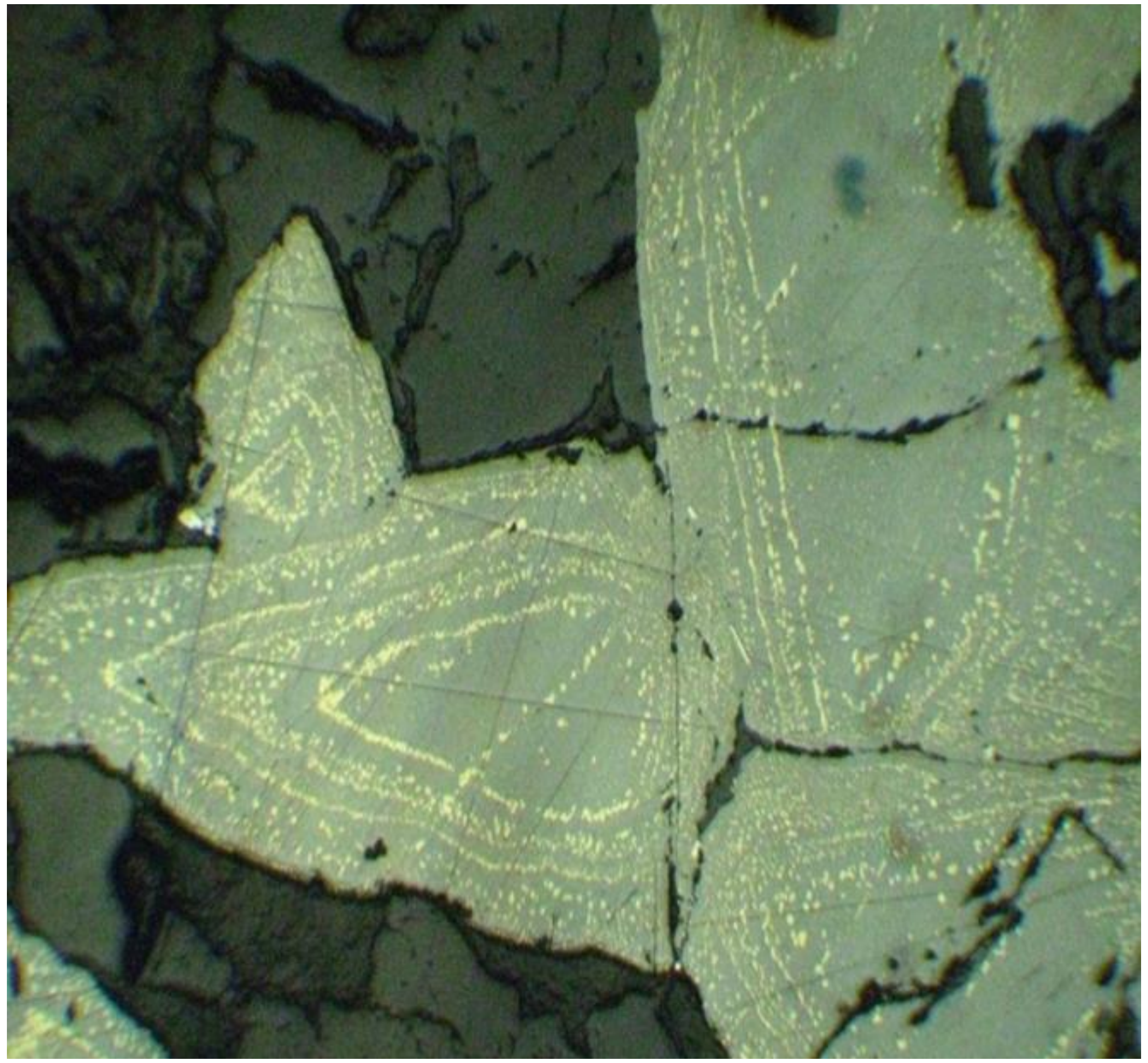
The cleavage and jointing of ore minerals in polished sections is weakly expressed, unlike in transparent grinds. Cleavage is observed in the form of one or more systems of parallel cracks. The number of systems of cracks depends on the number of planes of cleavage or jointing of the mineral and on the orientation of the polished surface. If the minerals have three or more directions of cleavage, then rows of triangular depressions.

TWINS OF GROWTH AND TRANSLATION

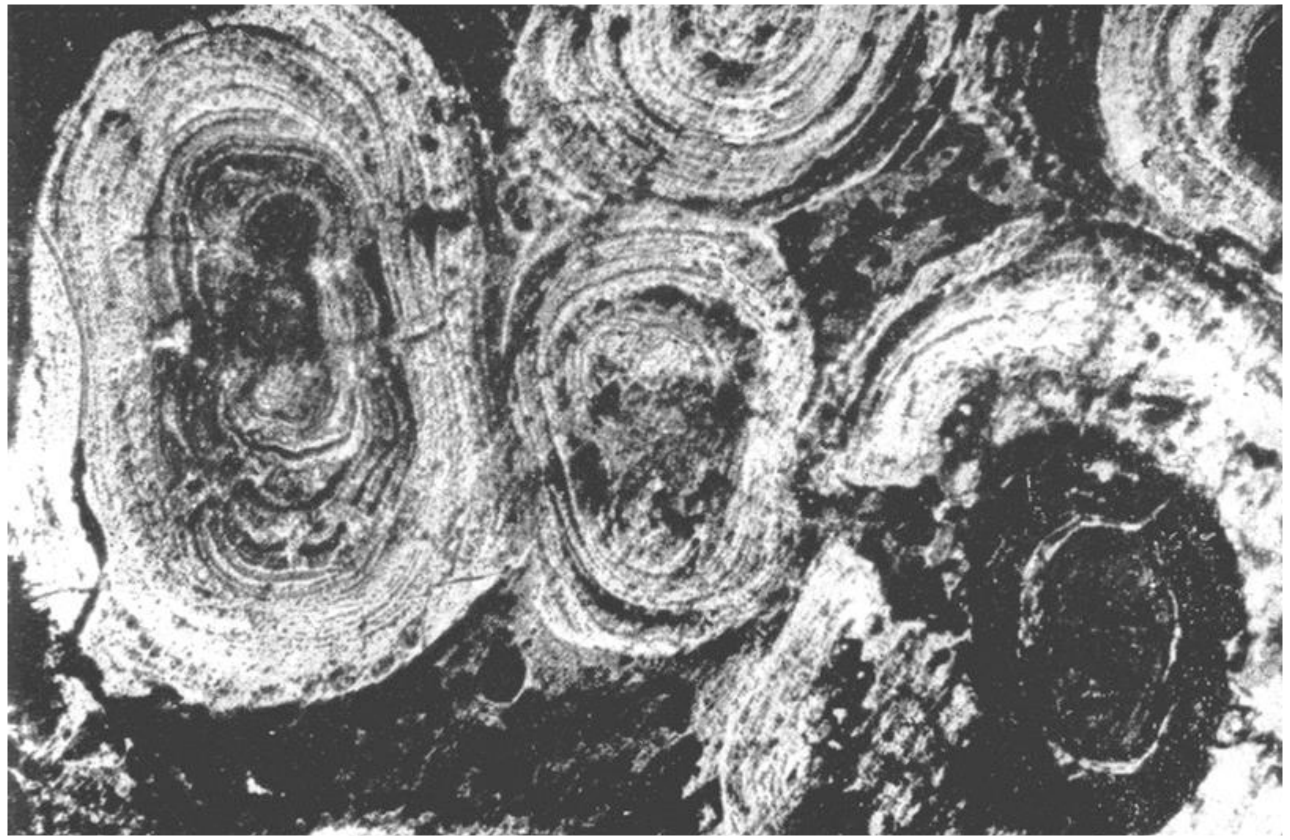
Twins of growth in ore minerals can be simple or complex, and the observed crystal may exhibit twinning according to one or more laws. Simple twins in the form of stars and swallowtails are characteristic of safflorite, polysynthetic twins are characteristic of molybdenite, antimonite, and specularite (visible in crossed nicols).



In ore minerals, both growth twinning and mechanical twinning (sliding, translocation) are observed. It is not always possible to distinguish between these types of twinning in mineralogical studies.



MINERAL ZONATION

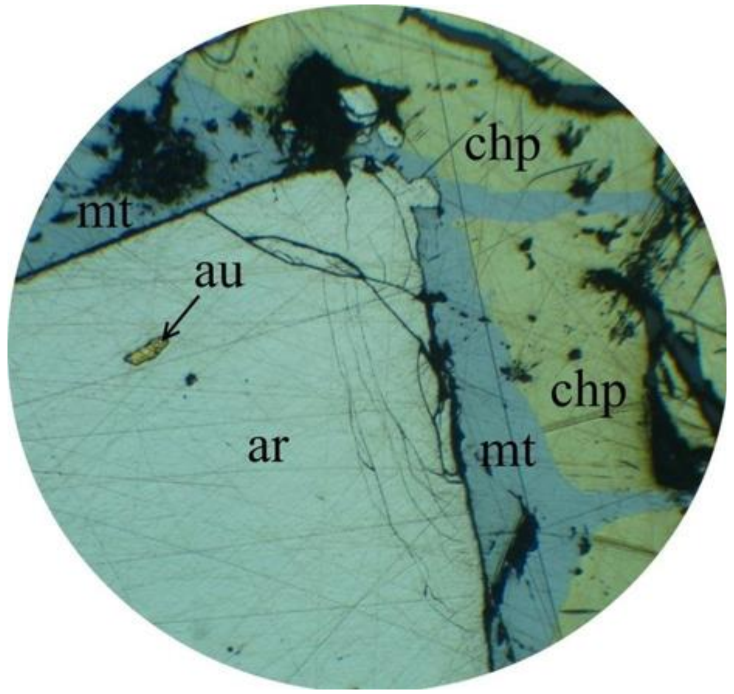


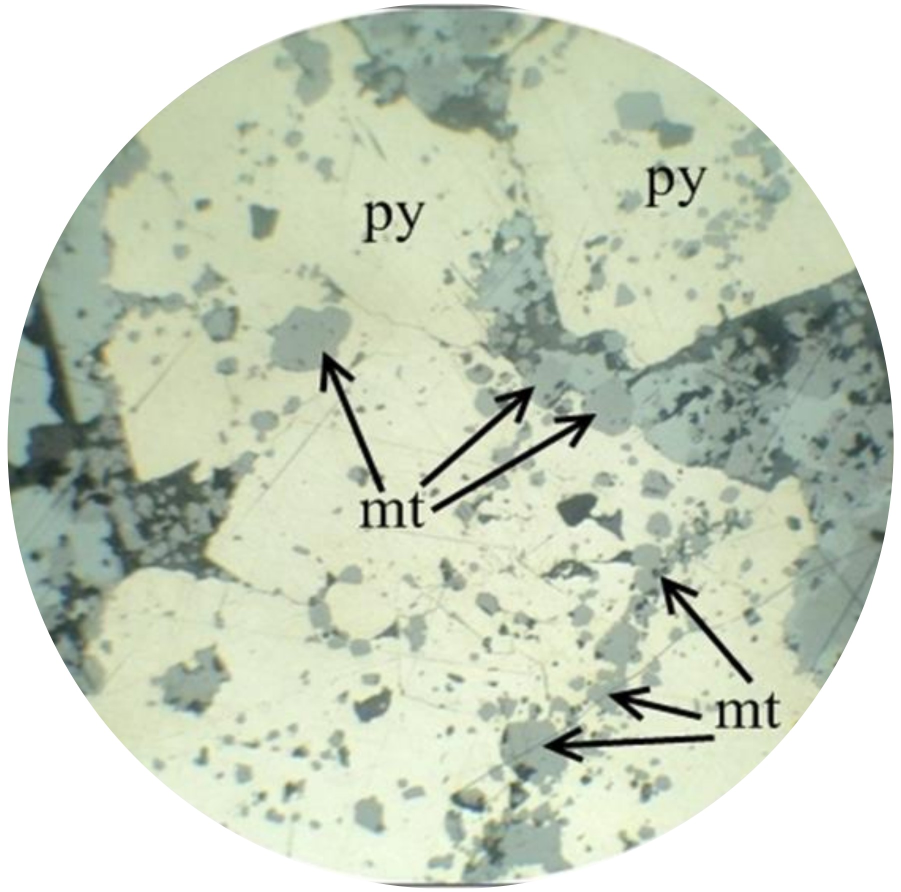
Reasons for the formation of zonation:

- breaks in the deposition of substances;
- rhythmic changes in the conditions of substance deposition;
- changes in grain growth rate;
- parallel crystallisation of grains of different minerals at certain stages of crystal growth and inclusion of these grains in the crystal body;
- changes in the composition of crystal layers deposited sequentially.

INCLUSION AND ACCRETIONS

Inclusion and accretion refer to the details of the shapes and relative positions of mineral grains, which are often only detectable under microscopic examination.
The inclusions can be located individually or in groups, have both regular and irregular outlines, be relatively large in size, and be extremely small.





Inclusions can be evenly or unevenly distributed in the host crystal. The characterization of inclusions depends on the way inclusions are formed and the host mineral. Inclusions may be micrograins of minerals accidentally trapped during the growth of the host mineral and their distribution may contribute to the manifestation of zonation of the host mineral growth. Often, inclusions are remnants of pre-existing minerals that were later replaced by the host mineral.

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