Motic®

User's Manual
First Order Red Compensator for Gout Screening

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MOTIC INSTRUMENTS INC.

- **What is Gout?**

  Gout is a painful and potentially disabling form of arthritis. Treatments are now available to control most cases of gout, but diagnosing gout can be difficult and treatment plans often have to be individualized to each person's medical problems and medications.

- **Cause**

  An excess of uric acid in the body causes Gout. This excess can be caused by an increase in production of uric acid in the body and by the inability of the kidneys to adequately clear uric acid from the body. With time, elevated levels of uric acid in the blood may lead to deposits around joints. Eventually, the uric acid may form needle-like crystals in joints, leading to acute gout attacks.

- **Diagnosis**

  The examination of viscous fluid in the membrane enclosing the joints for Monosodium urate crystal has led to the discovery of a second type of crystal - Calcium pyrophosphate dihydrate (CPPD) resembling gout, named "pseudogout" (not genuine, spurious.)

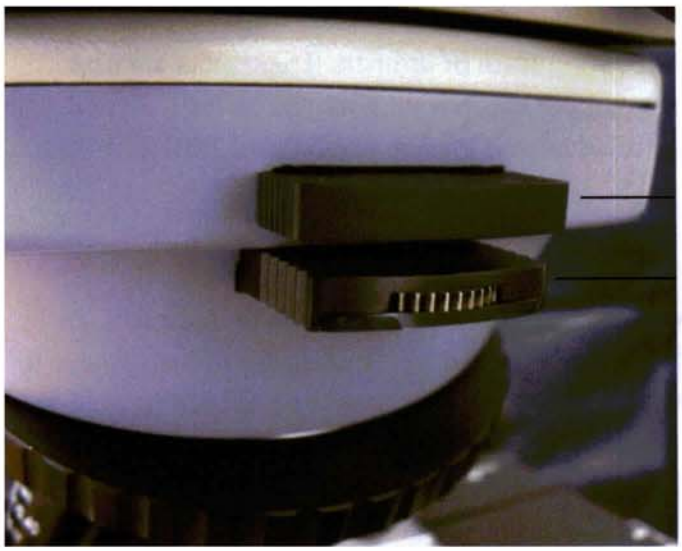
  Therefore, a differential diagnosis is required for treatment planning and is made possible utilizing the microscopic technique described below.

TESTING PROCEDURE FOR GOUT

When a microscope is fitted with a polarizer in the light path oriented in an East-West direction and an analyzer in the optical system oriented North-South, no direct light will pass and the field of view will appear dark.

If an unstained, birefringent specimen is placed on the stage between the polarizer and the analyzer there will be a resultant beam of light emerging from the specimen orientated at an angle to the E-W plane of vibration of the polarizer. As this emergent beam will have some components in the N-S direction and therefore will be able to pass through the analyzer, the object appears bright and visible against the dark field of the microscope.

Motic laboratory microscopes are fitted with two slots in the body above the nosepiece. These are intended for insertion of an analyzer slider and a retardation plate into the optical path.



Analyzer

First order red compensator (rotating)

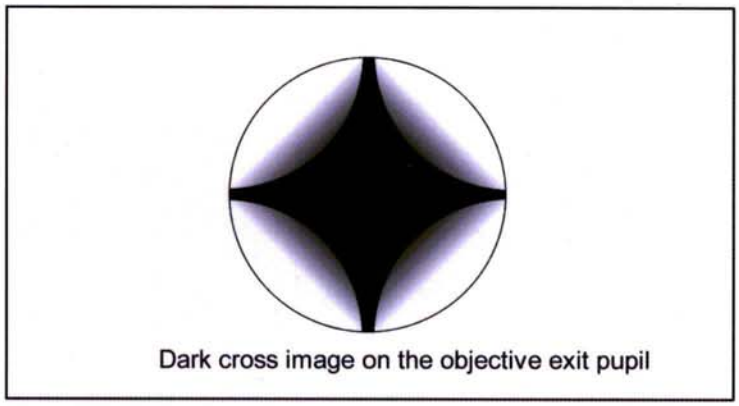
The most common retardation plate is the whole wave plate of value between 530 and 570nm and is called a λ (Lambda) or **"first order red" compensator**.

Definitive separation of urate from calcium pyrophosphate crystals is accomplished by the addition of a first order red compensator into the optical path. This device separates light according to components of slow and fast vibration.

The first order red compensator is placed at 45o between the crossed polarizers, with no specimen in the field. Light with a wavelength of 530nm is extinguished so that the resultant colour is magenta. As a minimal increase in retardation will alter the colour provided with the first order red compensator to blue, and an equally small decrease will change the colour to yellow, this compensator is formally called a "sensitive tint" plate.

● Preparation

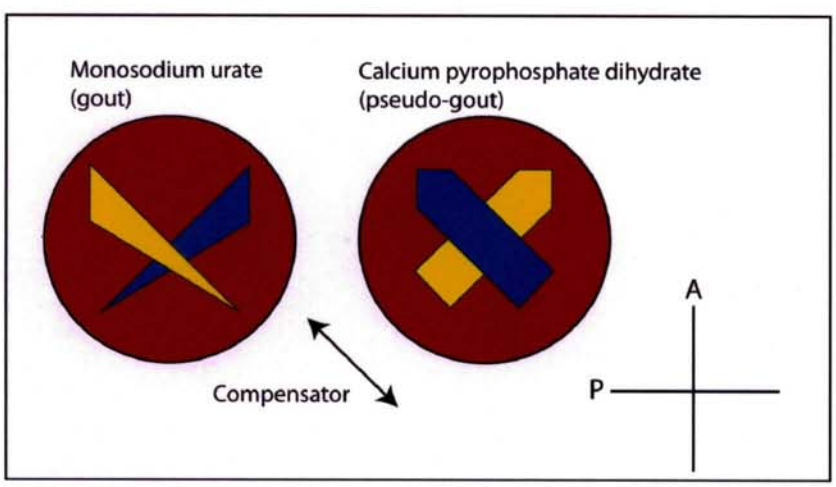
1. Remove first order red compensator out of the optical path.
2. Insert the analyzer slider into the upper slider holder slot, with the insertion index facing up, until it clicks stop.
3. Place the polarizer over the field lens on the base of the microscope.
4. Make certain there is no specimen in the optical path on the stage.
5. Remove an eyepiece and look through the eyepiece tube. Observe the bright circle of exit pupil of the objective.



6. Rotate the polarizer until a dark cross image is formed on the exit pupil of the objective.

● Microscopy

1. Remove the first order red compensator slider out of the optical path.
2. Place the specimen on the stage and sharply focus on the specimen, which appears white in the dark field of view.
3. Among the needle shaped crystals seen in the field of view, note the crystals running in the vertical direction.
4. Insert the first order red compensator slider into the optical path with compensator rotating ring in clockwise stop position and observe above crystals. If the crystals are Monosodium Urate from Gout, they will appear yellow and then appear blue when the compensator rotating ring is turned to counter-clockwise stop position.



5. If the crystals are Calcium Pyrophosphate Dihydrate (CPPD) from pseudogout, they will appear blue when the compensator rotating ring is in an extreme left position and appear yellow when the compensator rotating ring is turned to an extreme right position.

● Identification of synovial fluid crystals

Crystal type	Morphology	Direction of birefrigence	Colour with first order red compensator
Monosodium urate	Thin, needle-shaped	Negative	Yellow parallel, blue perpendicular
Calcium pyrophosphate dihydrate (CPPD)	Four-sided figureshort, uneven	Positive	Blue parallel, yellow perpendicular

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