

Optical Mineralogy

Becke Lines and Relief

Relief – darkness of grain boundaries

- High relief – very dark outline
- Low relief – grain blends into refractive index oil

Positive relief – $n_{\text{oil}} \ll n_{\text{mineral}}$

Negative relief – $n_{\text{oil}} \gg n_{\text{mineral}}$

Becke Line Method –

- $n_{\text{mineral}} > n_{\text{oil}}$; mineral acts as converging lens – concentrating light above mineral
- $n_{\text{mineral}} < n_{\text{oil}}$; mineral acts as diverging lens – concentrating light at grain boundaries

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Becke Line Method –

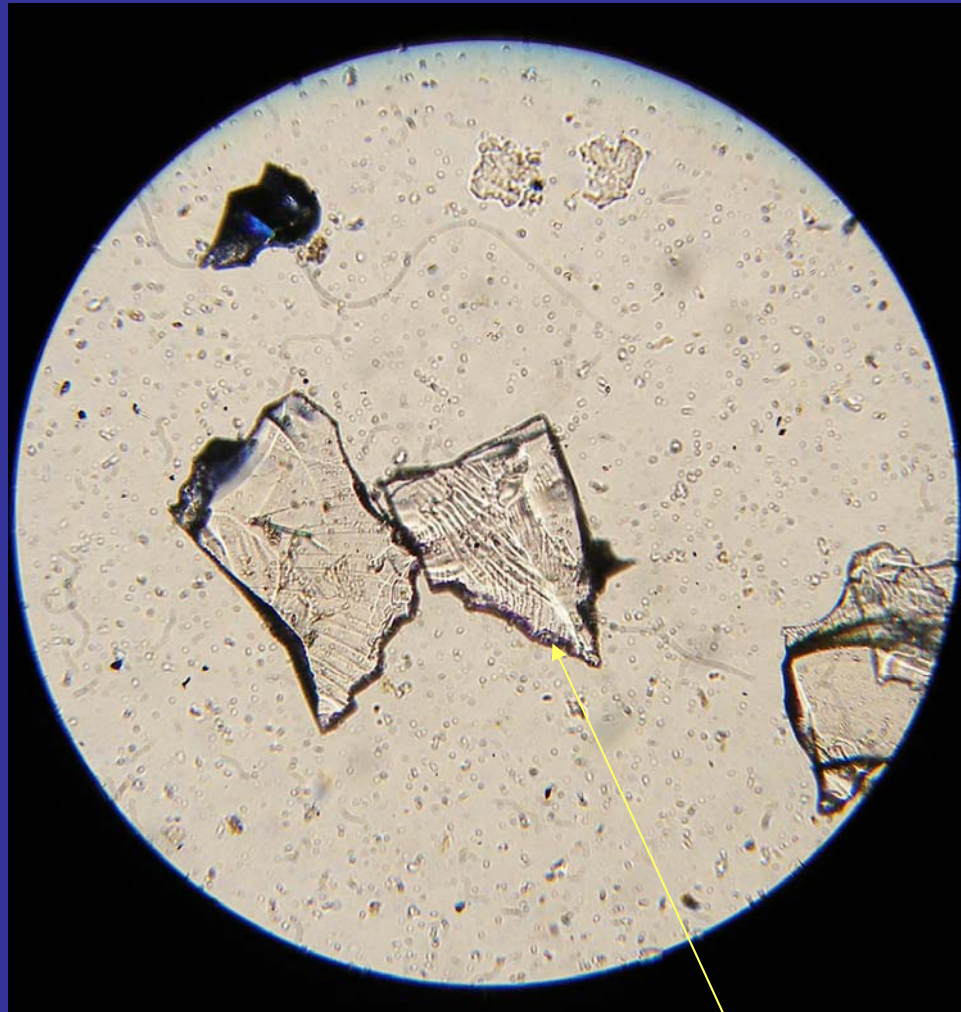
1. Use medium objective in PPL
2. Close down aperture diaphragm some
3. Lower stage
4. Becke line is band of light along grain boundaries
5. If Becke line moves into oil from mineral, $n_{\text{oil}} > n_{\text{mineral}}$
6. If Becke line moves into mineral from oil, $n_{\text{mineral}} > n_{\text{oil}}$

Colored Becke lines indicate $n_{\text{mineral}} = n_{\text{oil}}$.

- Orange yellow line into mineral
- Green-blue line into oil

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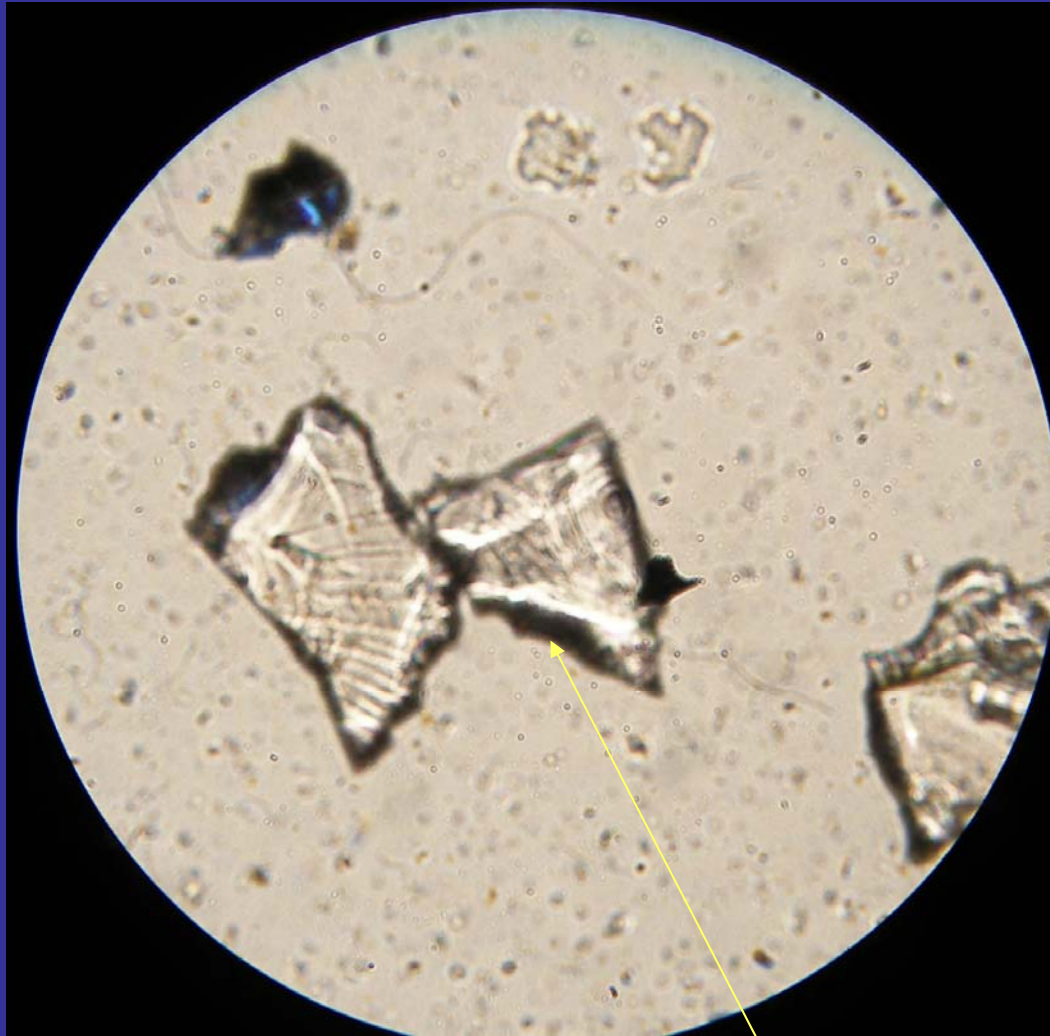
Becke Lines and Relief



Garnet grains showing high positive relief in refractive index oil with $n = 1.55$.

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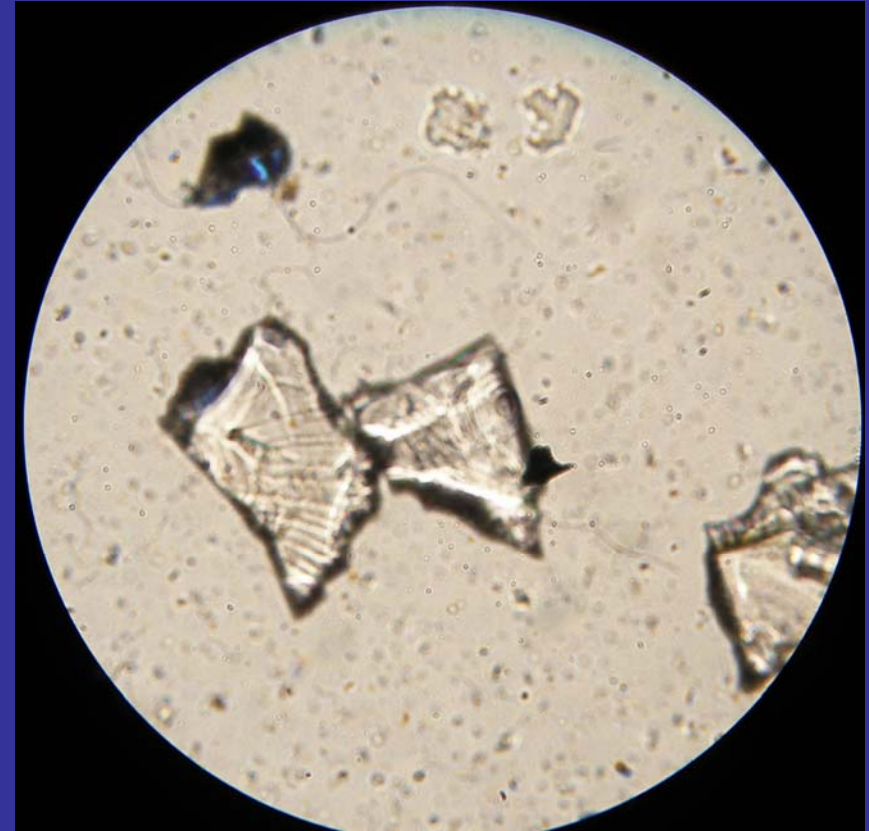
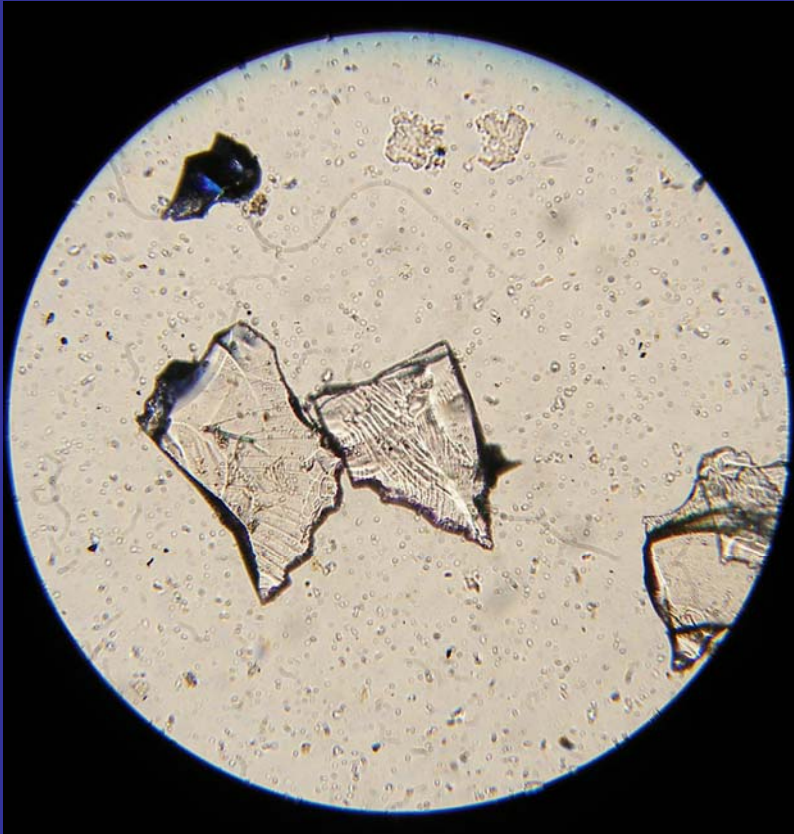
Becke Lines and Relief



Garnet grains showing Becke Line moving into the refractive index oil with $n = 1.55$.

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Becke Lines and Relief



Garnet grains showing Becke Line moving into the refractive index oil with $n = 1.55$.

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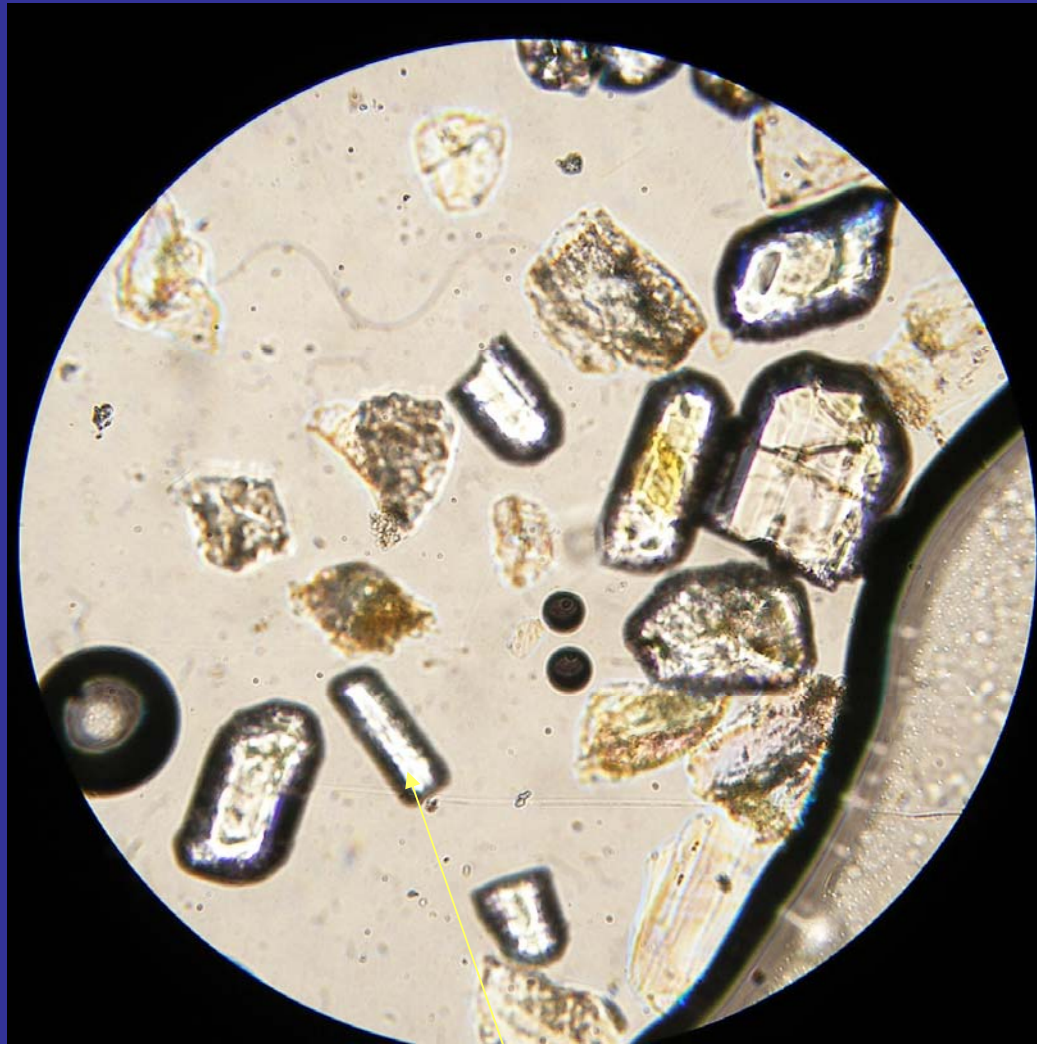
Becke Lines and Relief



Apatite grains showing high positive relief in refractive index oil with $n = 1.55$.

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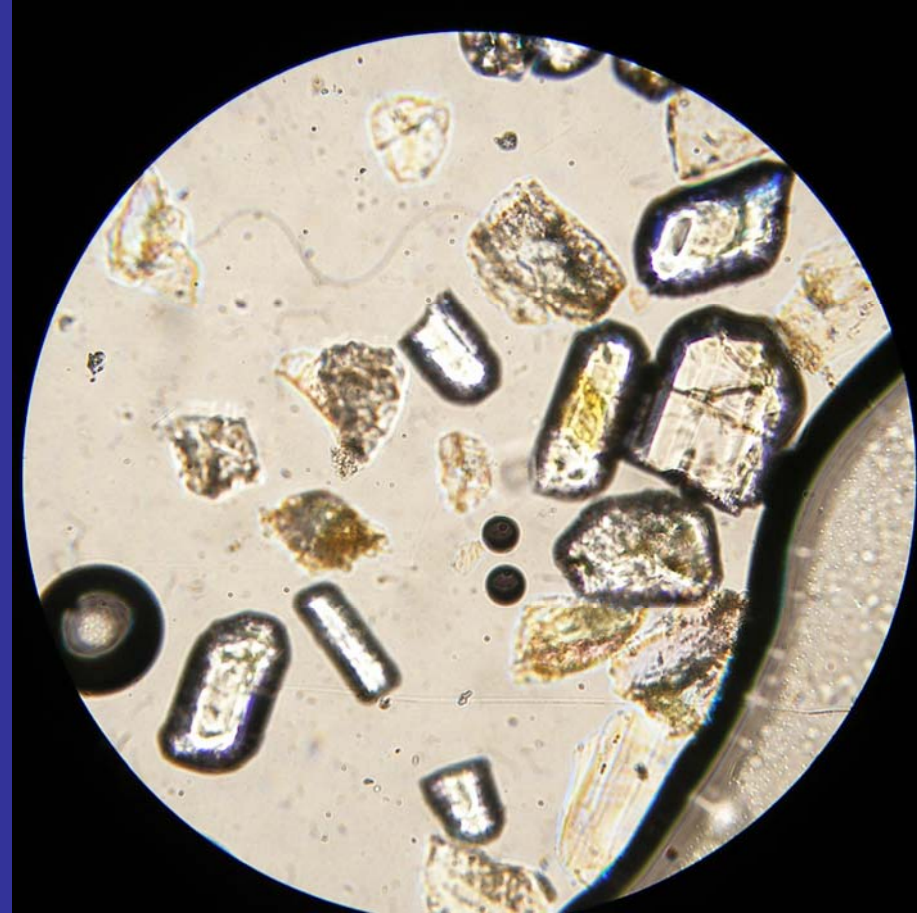
Becke Lines and Relief



Apatite grains showing Becke line moving into refractive index oil with $n = 1.55$.

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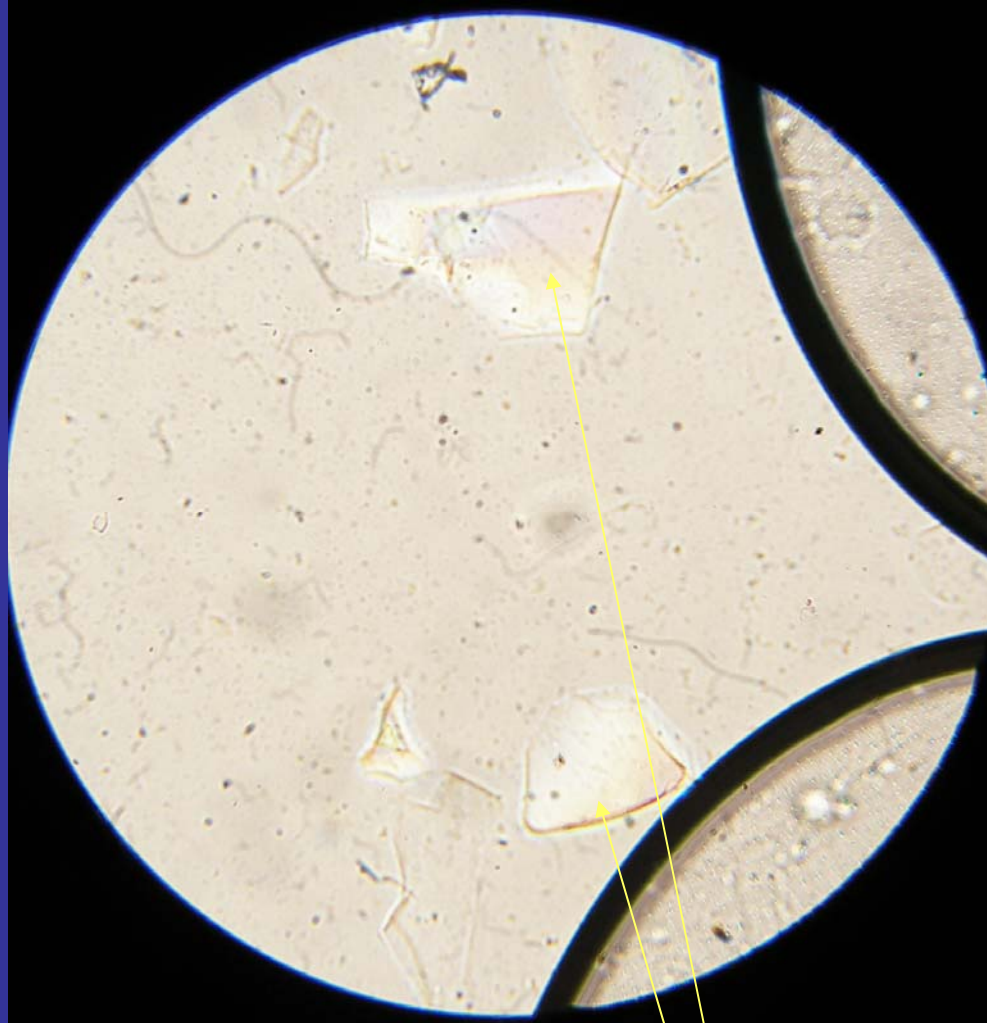
Becke Lines and Relief



Apatite grains showing Becke line moving into refractive index oil with $n = 1.55$.

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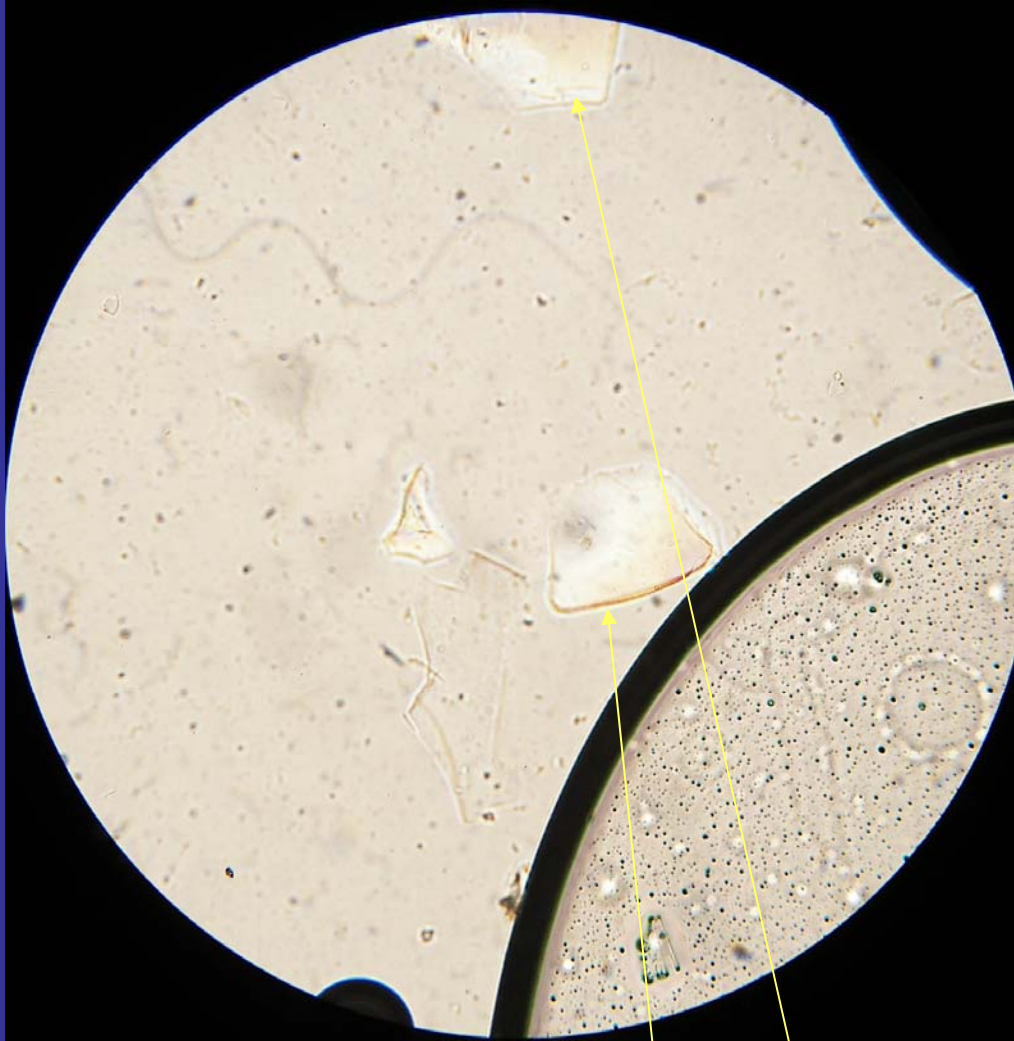
Becke Lines and Relief



Quartz grains showing very low relief in refractive index oil with $n = 1.55$.

Optical Mineralogy

Becke Lines and Relief



Quartz grains showing a colored Becke line in refractive index oil with $n = 1.55$.

Optical Mineralogy

Becke Lines and Relief



Sodalite grains showing moderate to high negative relief in refractive index oil with $n = 1.55$.

Optical Mineralogy

Becke Lines and Relief



Sodalite grains showing Becke line moving into refractive index oil with $n = 1.55$.