

OLIVINE

Chemical formula: $(\text{Mg,Fe})_2[\text{SiO}_4]$

solid solution between forsterite $\text{Mg}_2[\text{SiO}_4]$ (= Fo) and fayalite $\text{Fe}_2[\text{SiO}_4]$ (= Fa)

Crystal system: orthorhombic

Color in thin section: usually colorless to pale yellow (for common fayalite-poor olivine),
fayalite-rich olivine is strongly pleochroic: X = Z = pale yellow, yellowish green
Y = orange, yellowish, reddish brown

Form: slightly elongated idiomorphic crystals (in volcanites), subequant, allotriomorphic grains or aggregates of grains

Cleavage: good on {001} and {010}

Indices of refraction: $n_\alpha = 1.635 - 1.824$ $n_\beta = 1.651 - 1.864$ $n_\gamma = 1.670 - 1.875$

Birefringence: 0.034 – 0.051

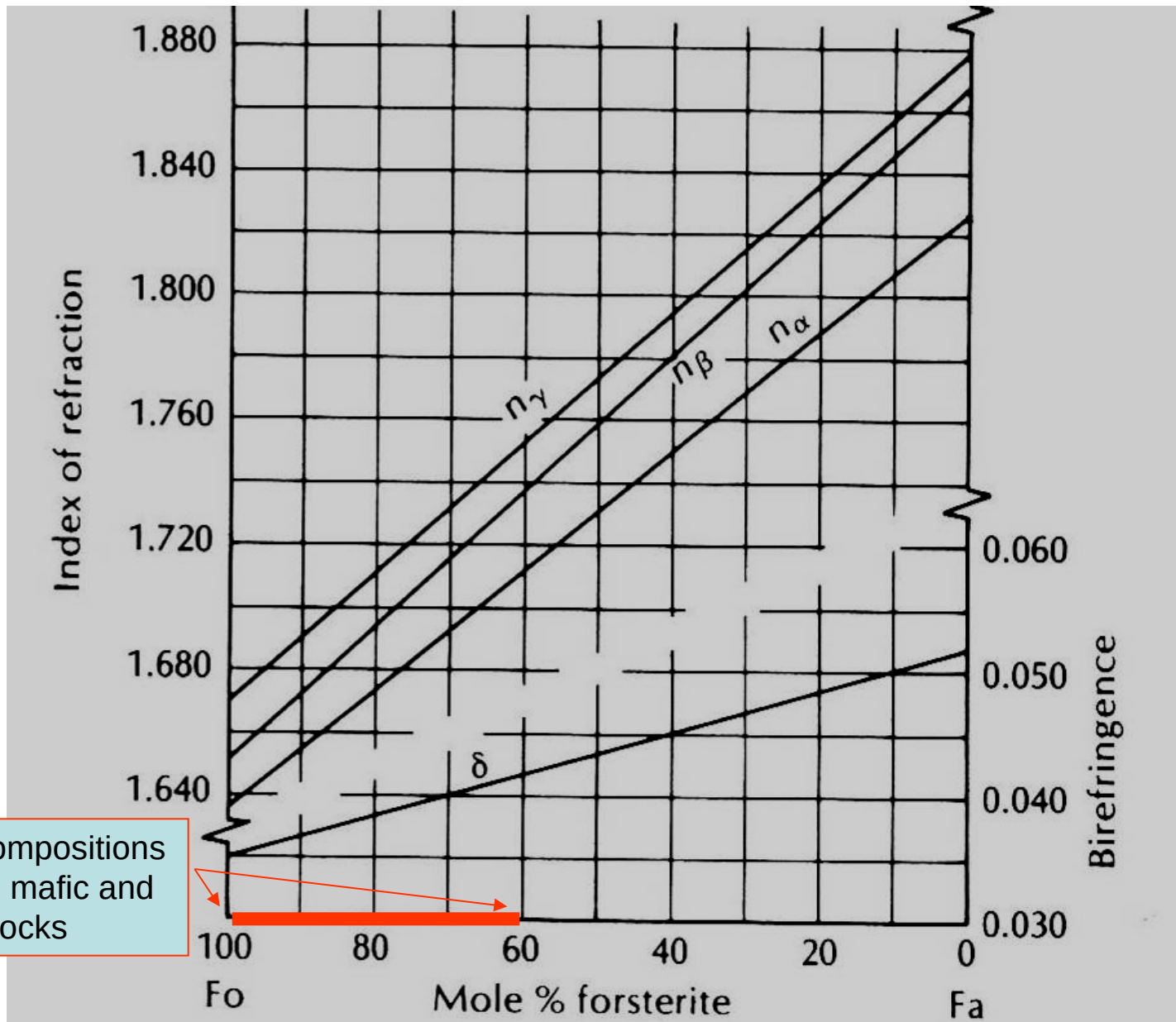
Optic sign: biaxial positive or negative

Alteration: may be altered to so-called iddingsite (a fine-grained reddish-brown or yellowish-brown material consisting of goethite, chlorite, clay, talc..., it may display birefringence of about 0.005) or chlorophaeite (a mixture of limonite, chlorite and serpentine, essentially isotropic, usually orangish or greenish), may alter to serpentine group minerals plus magnetite

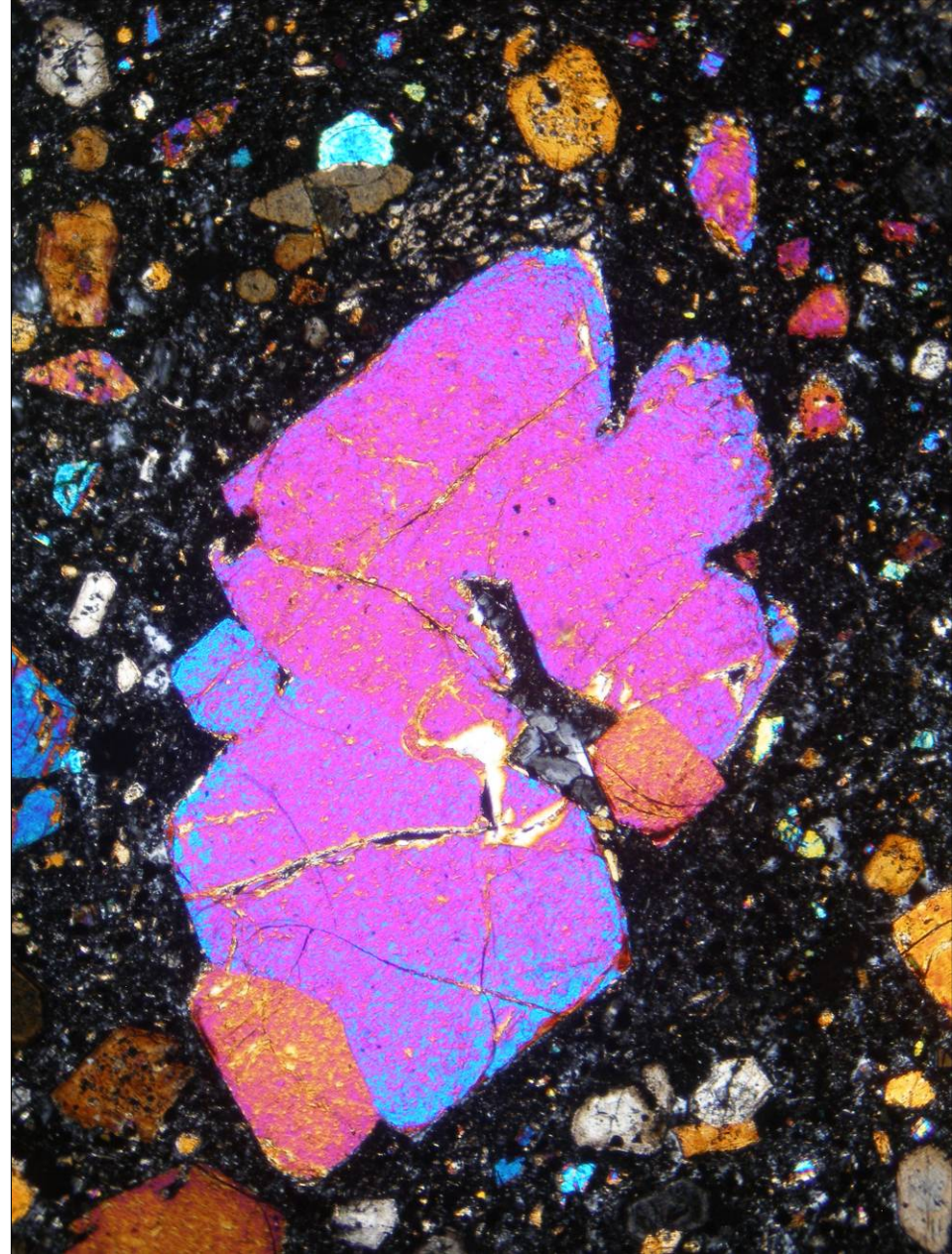
Occurrence: commonly in mafic and ultramafic magmatites (basalt, gabbro, peridotite, pyroxenite), occasionally in less mafic rocks (syenite, phonolite, trachyte, andesite, rhyolite, granite) and metamorphic rocks (marble, iron-ores)

Similar minerals in thin sections: clinopyroxenes (lower birefringence, better cleavage, inclined extinction, often lamellar twinning)

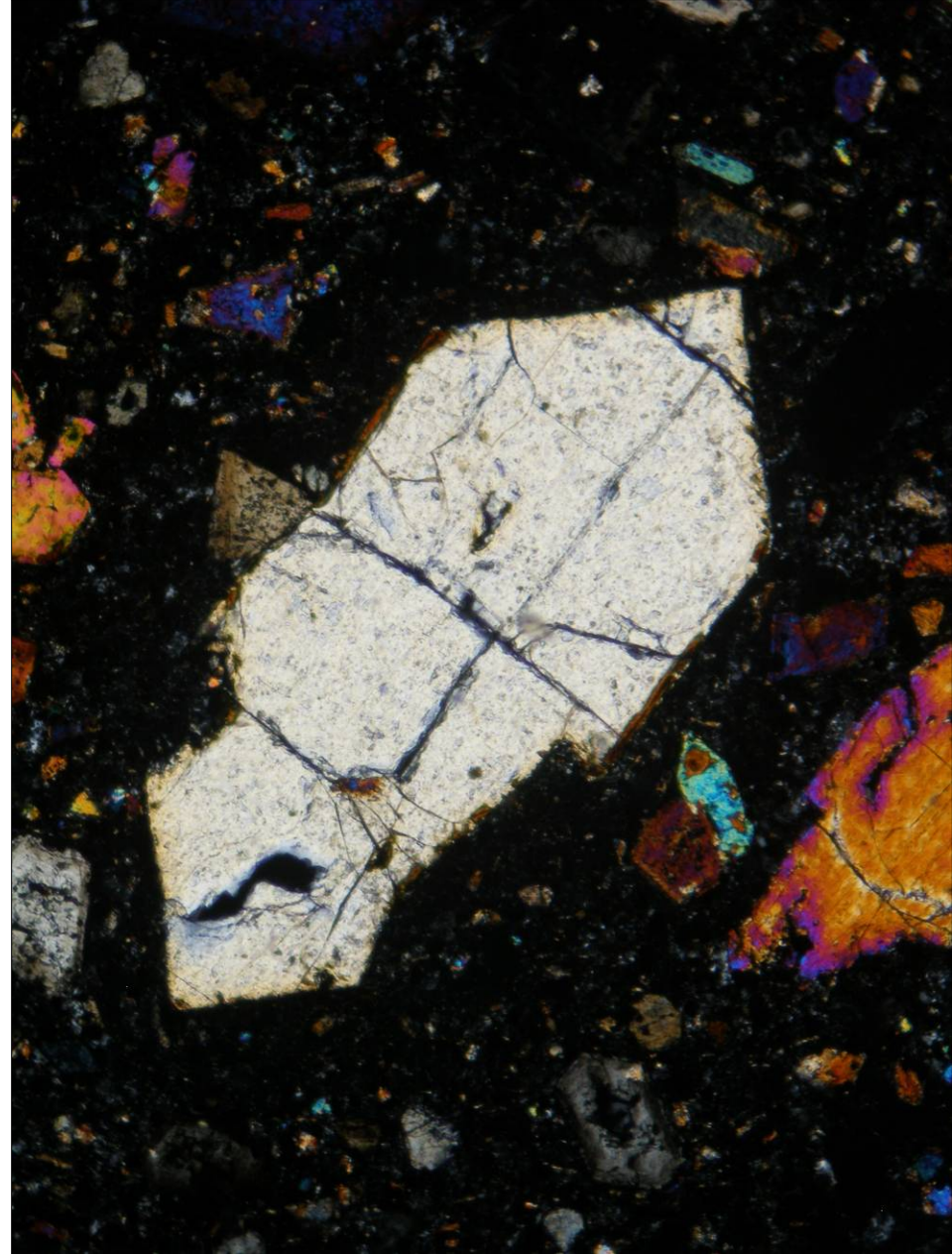
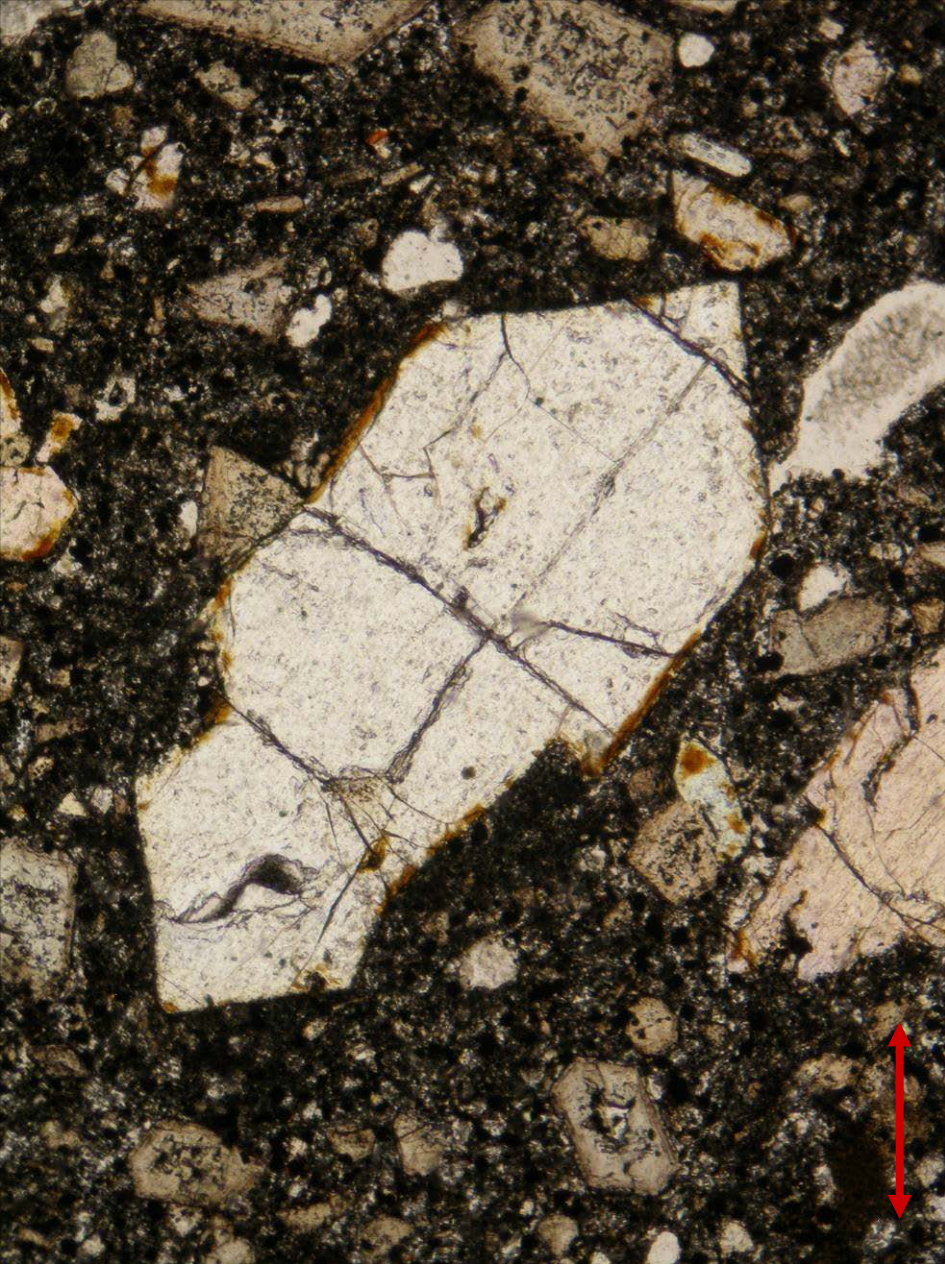
Indices of refraction and birefringence for olivine (Nesse 1991)



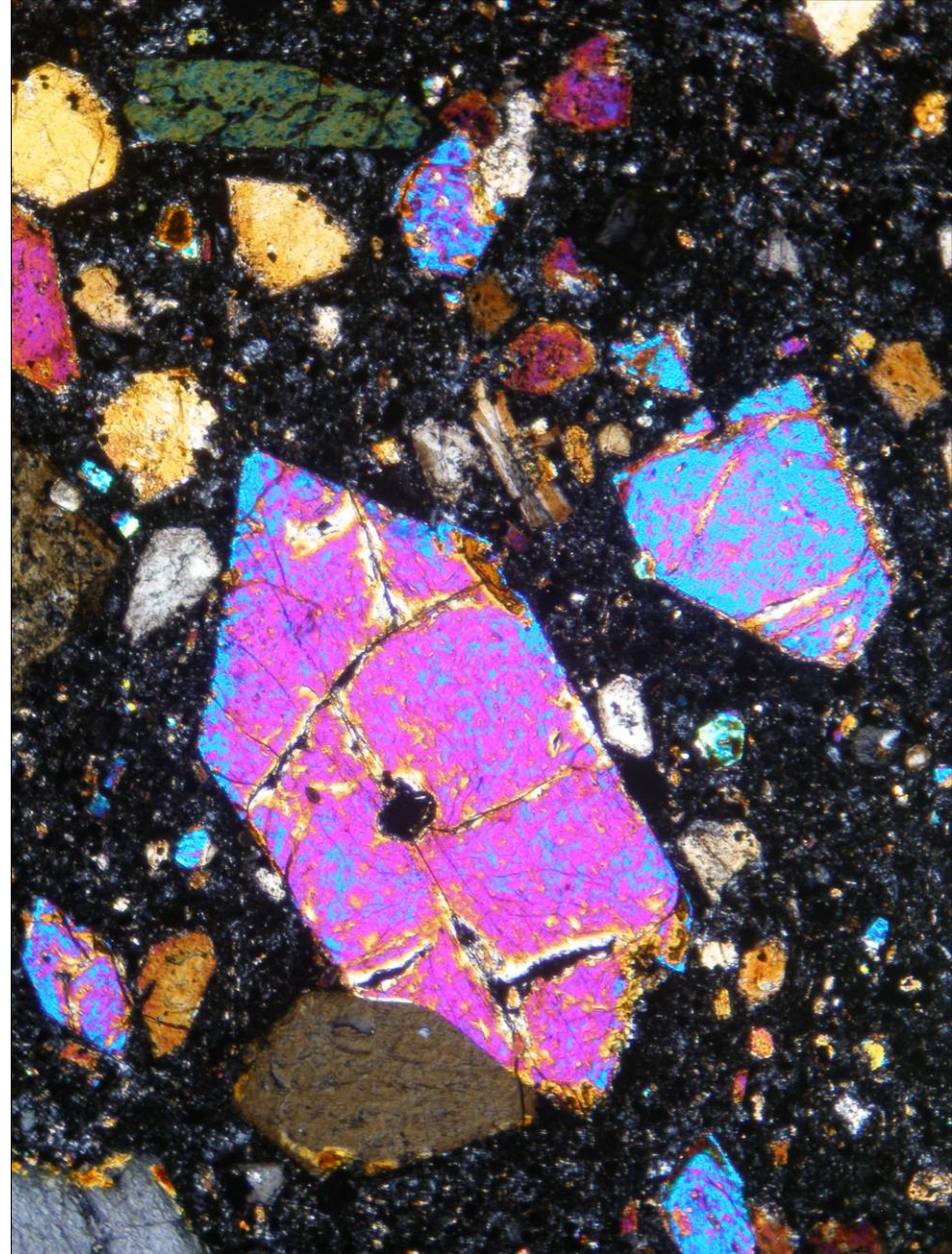
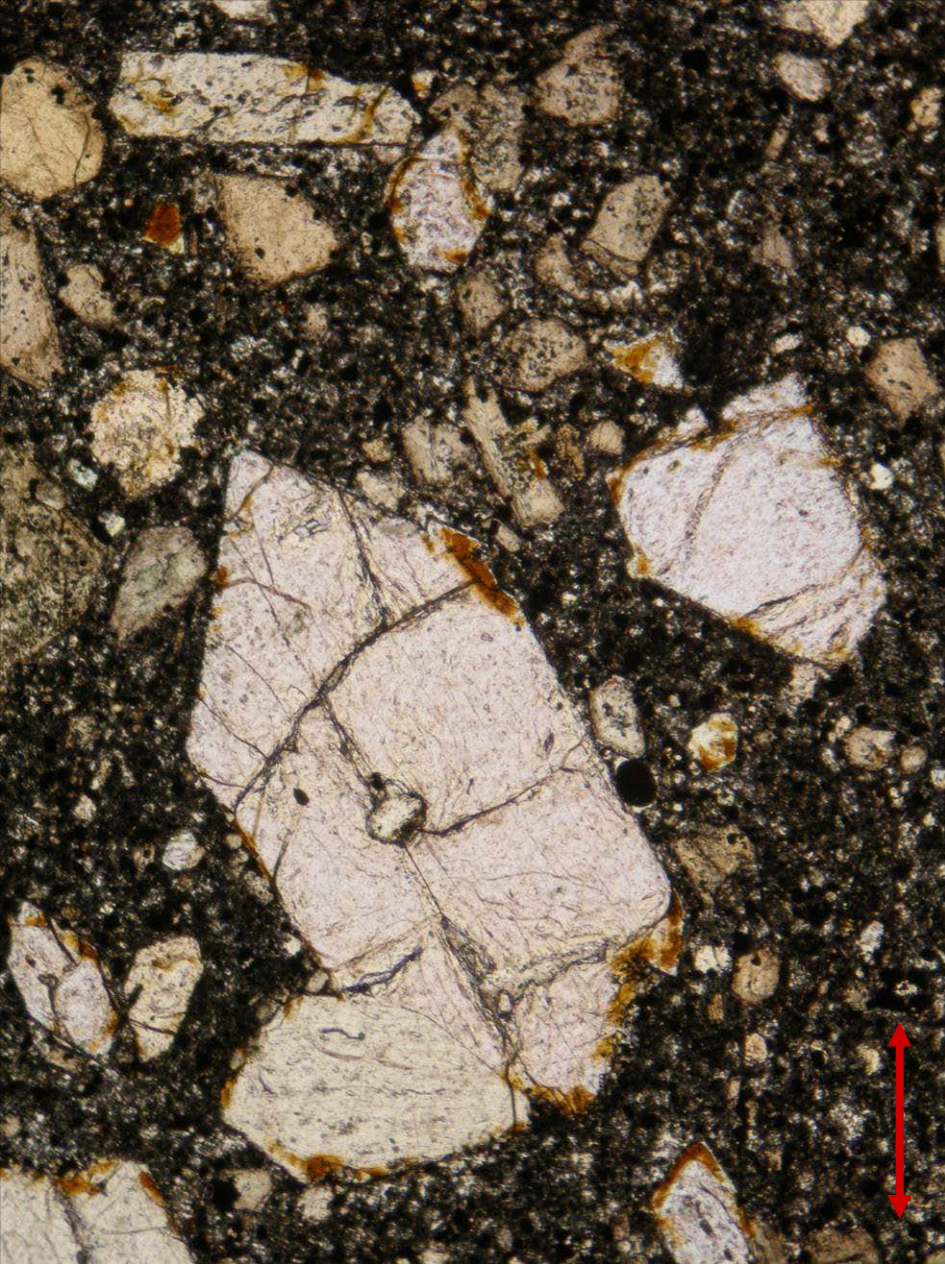
common compositions
of olivine in mafic and
ultramafic rocks



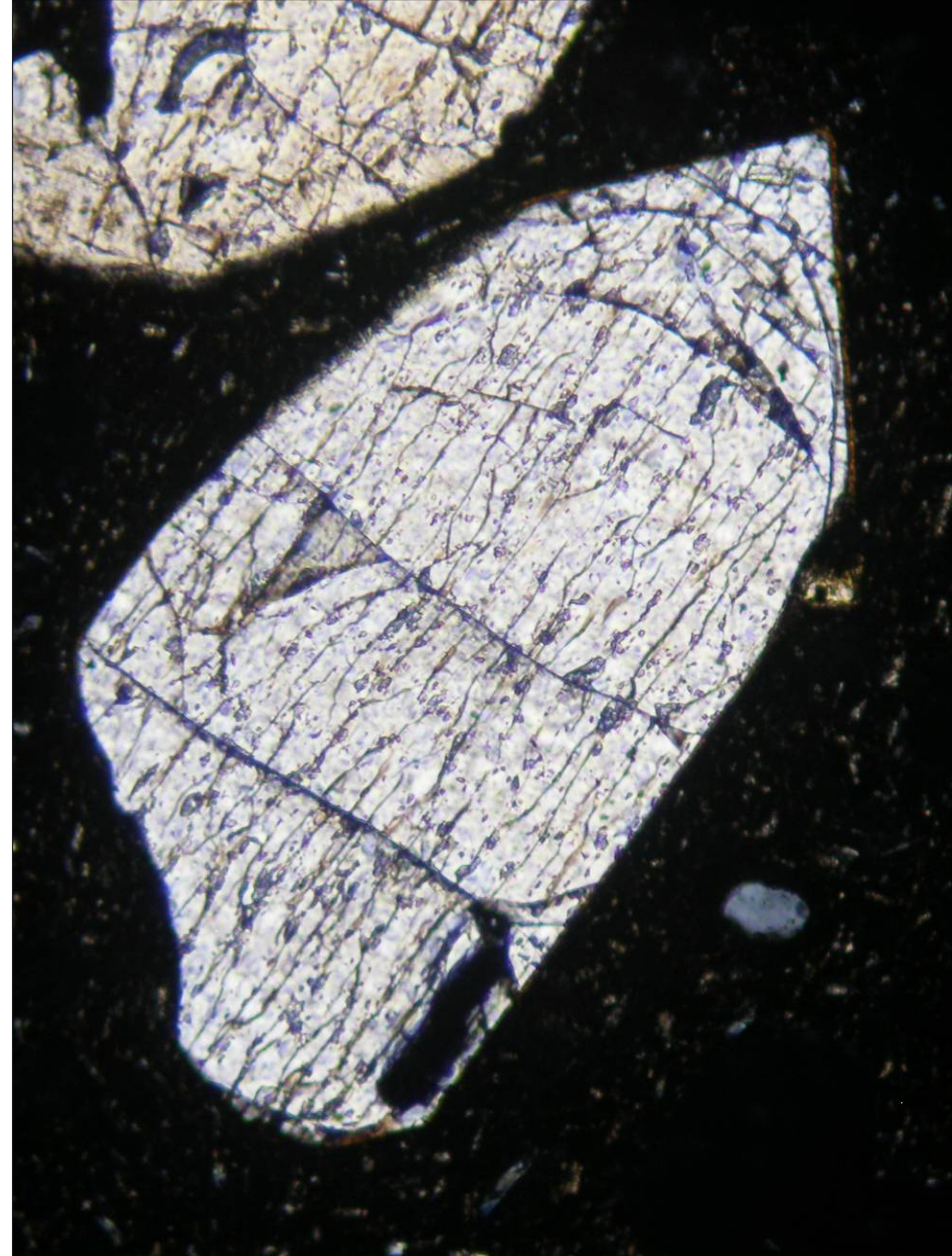
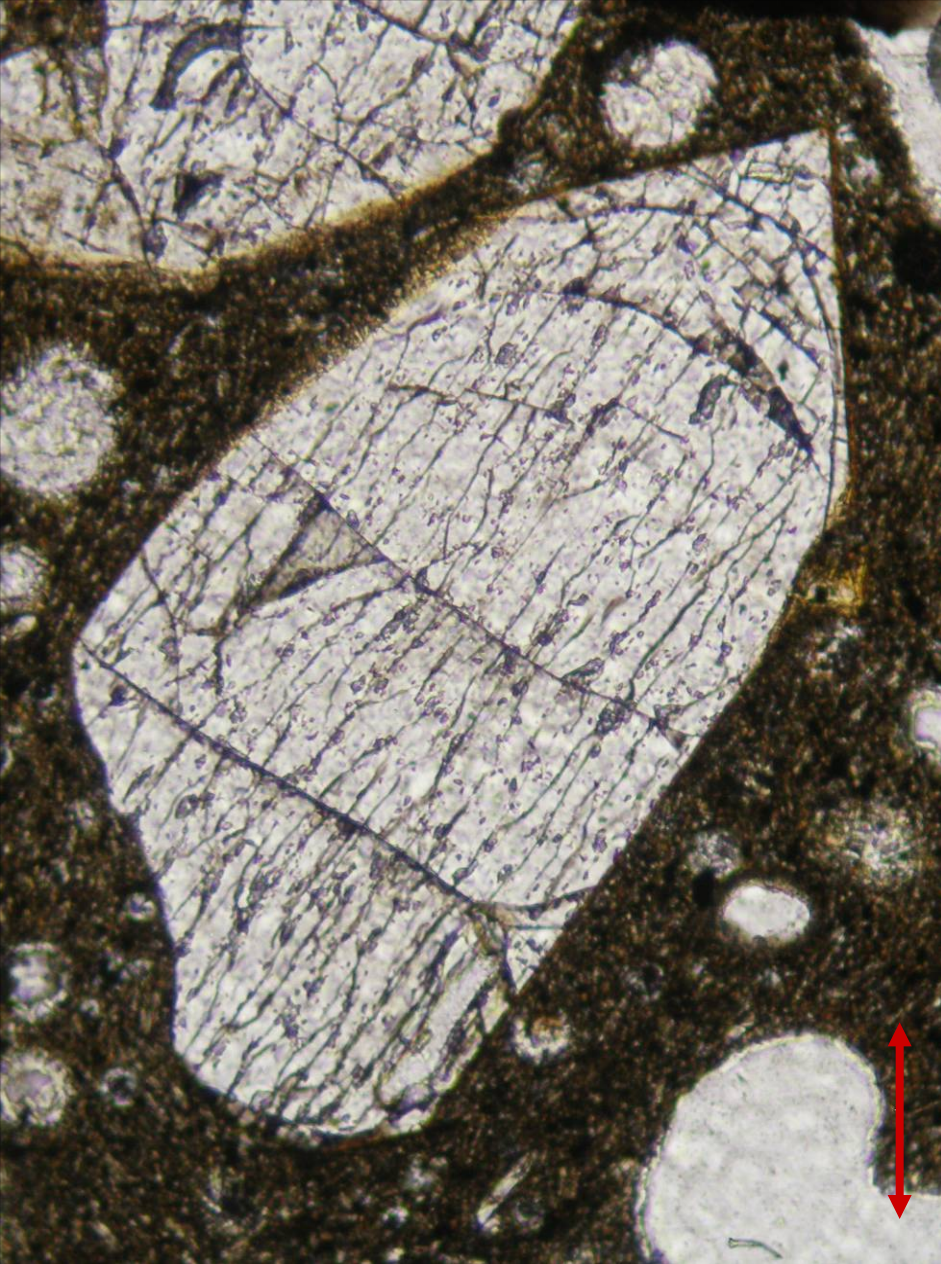
Olivine phenocryst in basanite to nephelinite from Mezina, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2.5 mm. Photo: JiZi.



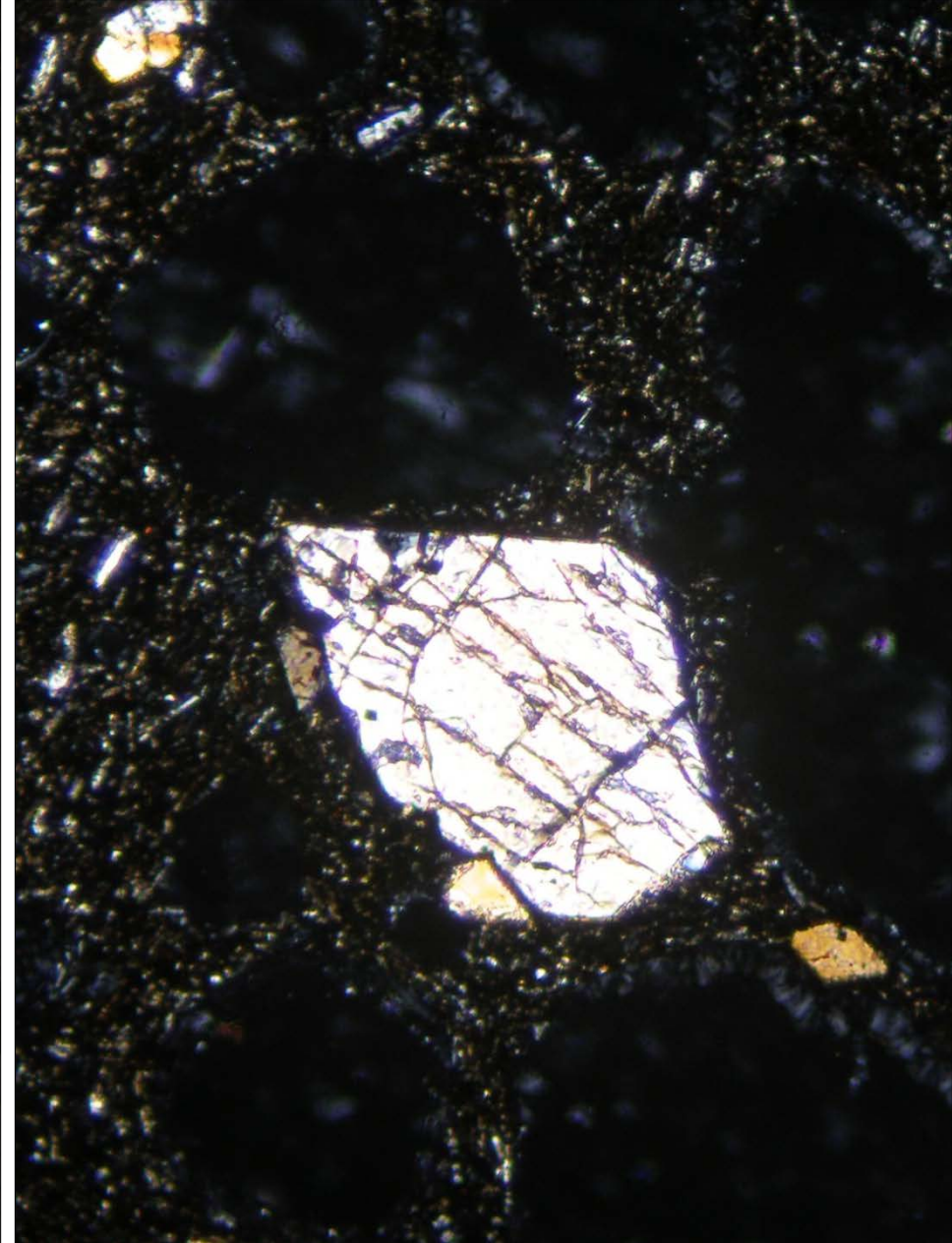
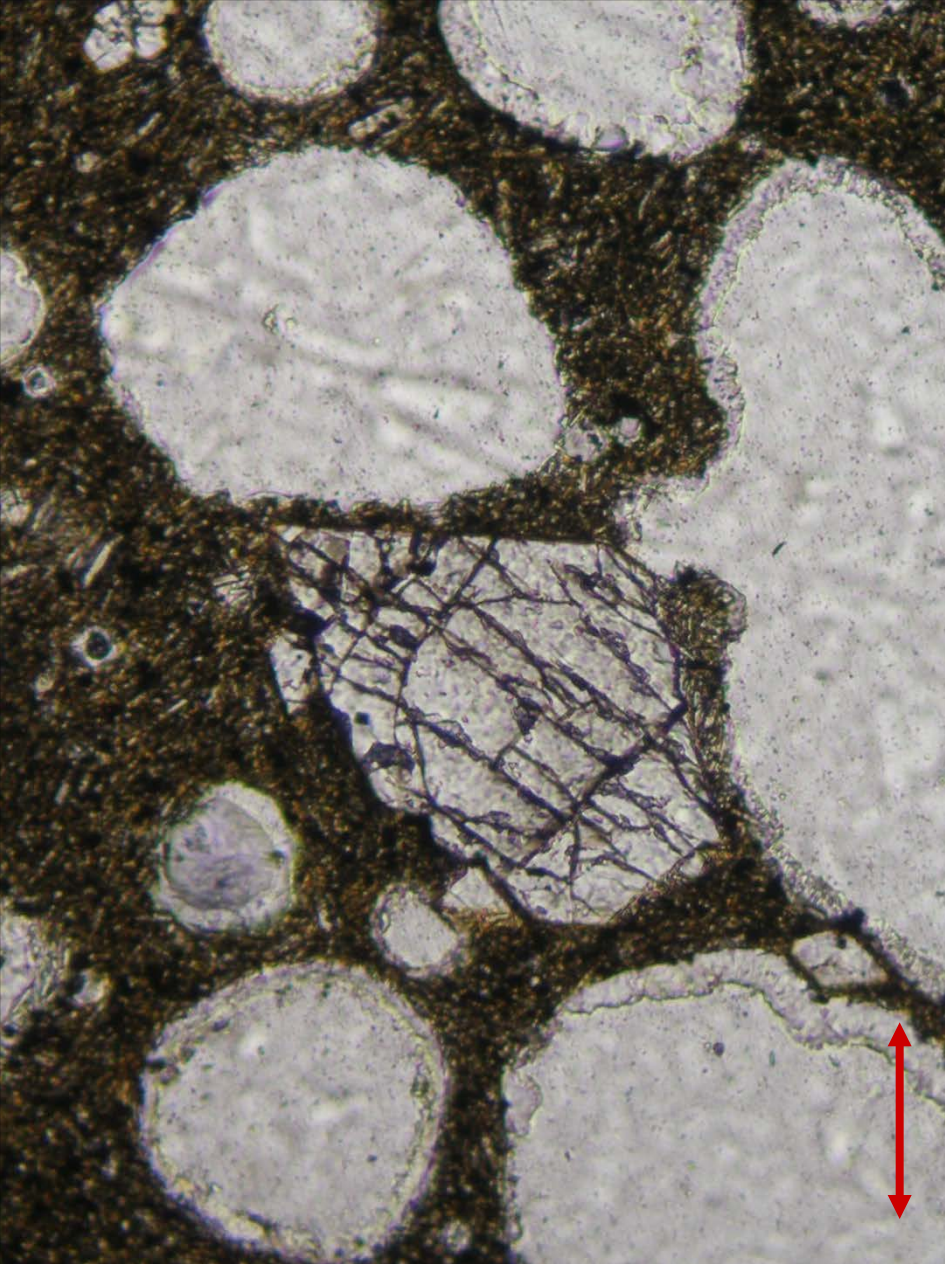
Olivine phenocryst in basanite to nephelinite from Mezina, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2 mm. Photo: JiZi.



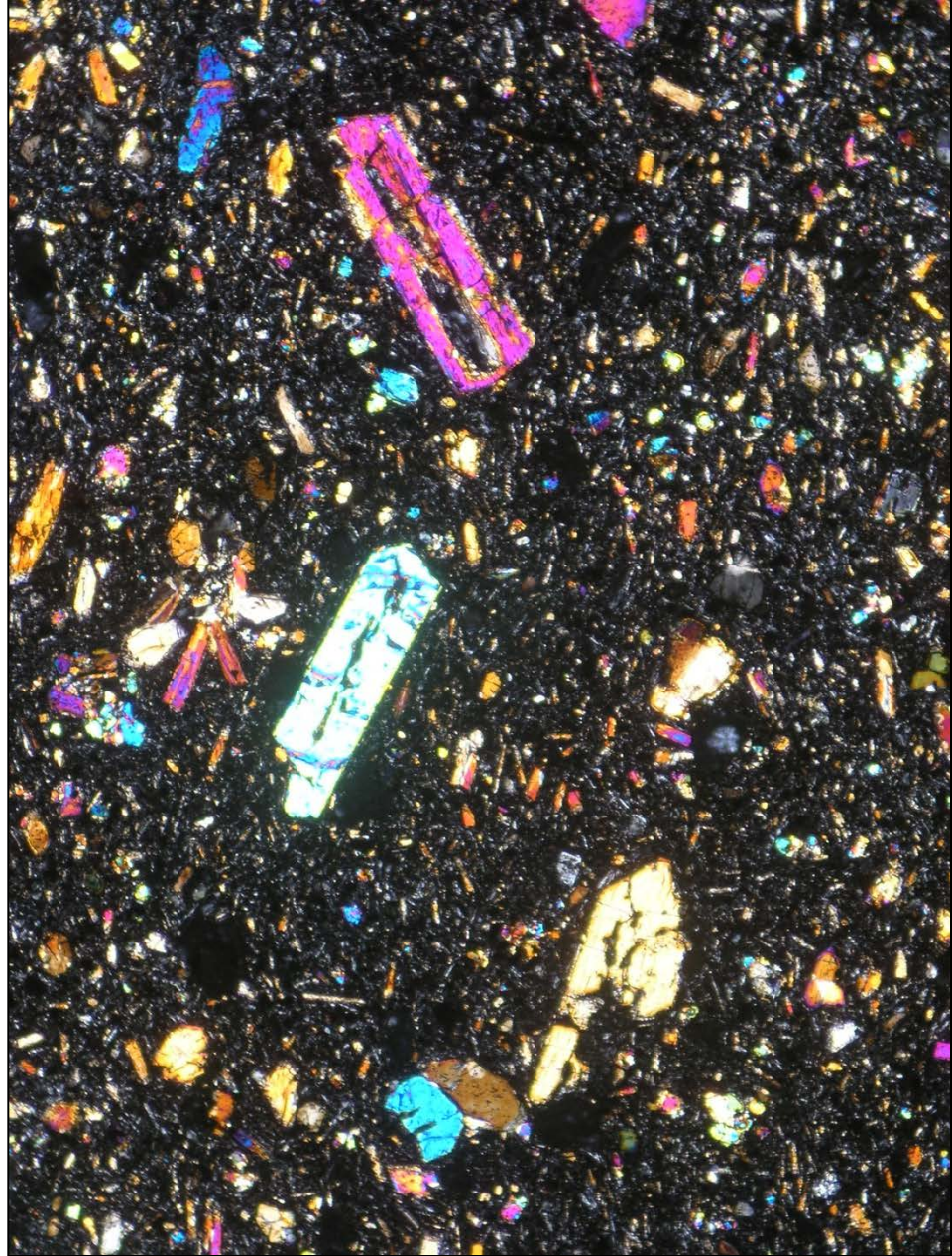
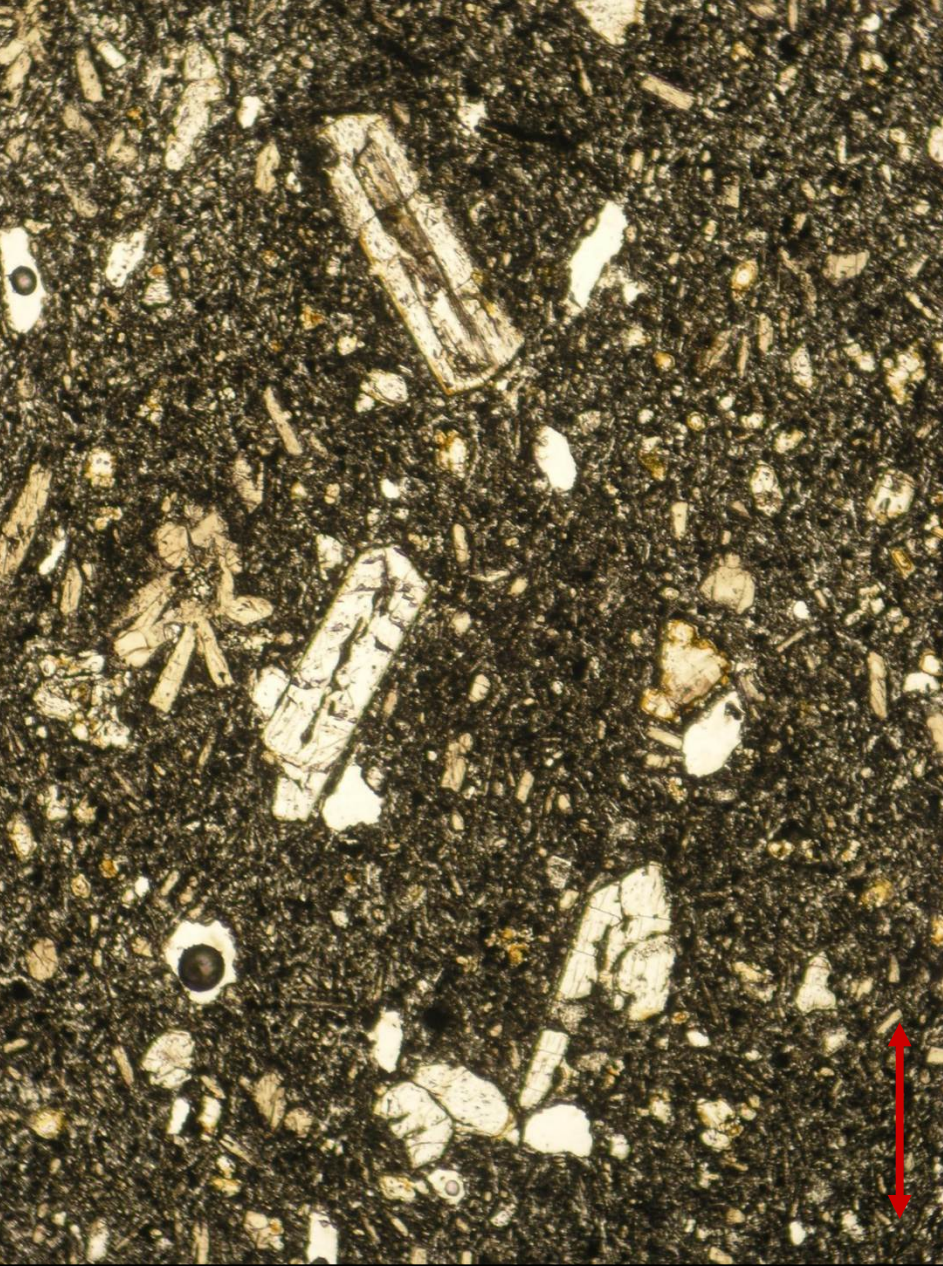
Olivine phenocrysts in basanite to nephelinite from Mezina, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2 mm. Photo: JiZi.



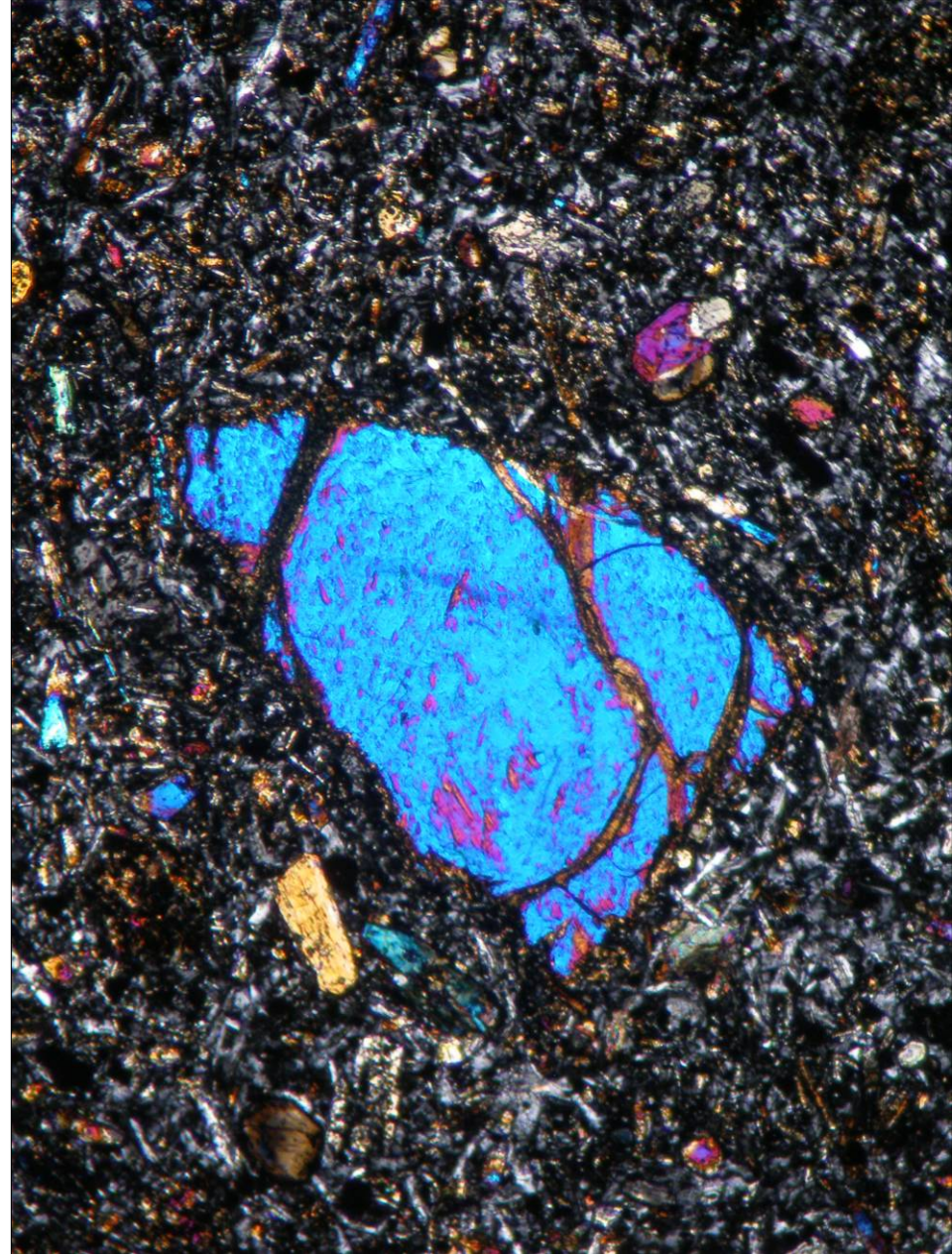
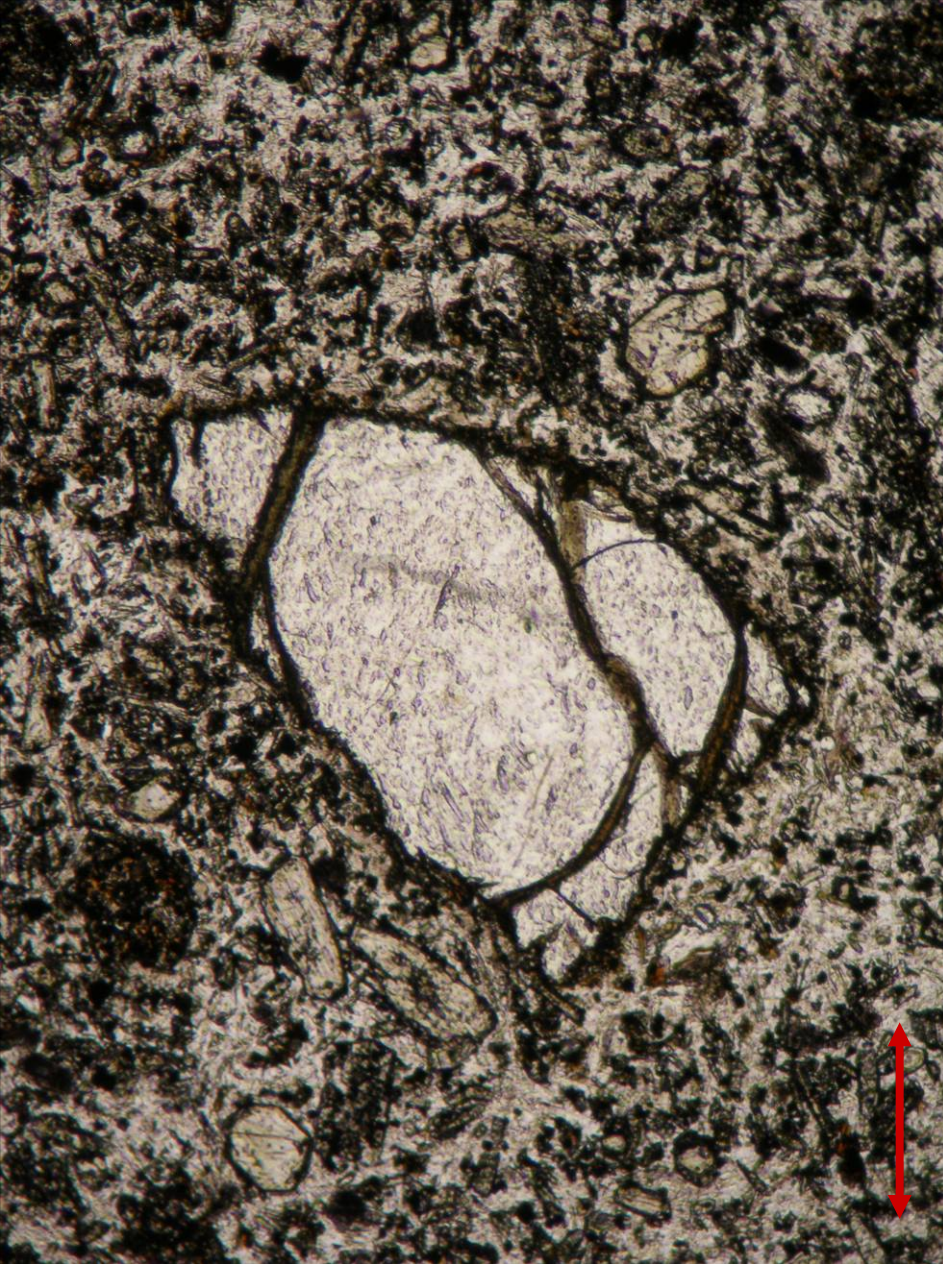
Olivine phenocryst in basanite from Bruntál, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.6 mm. Photo: JiZi.



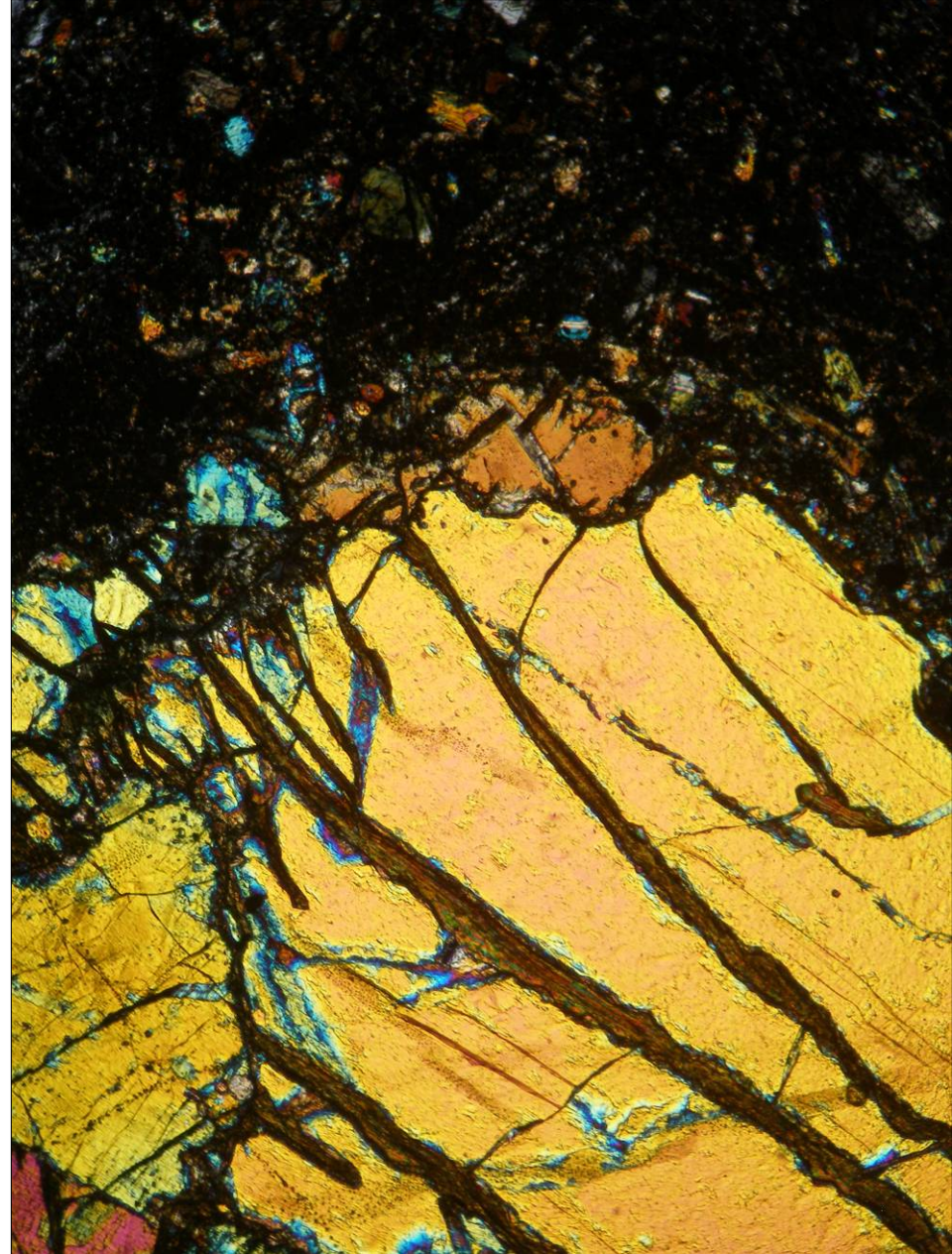
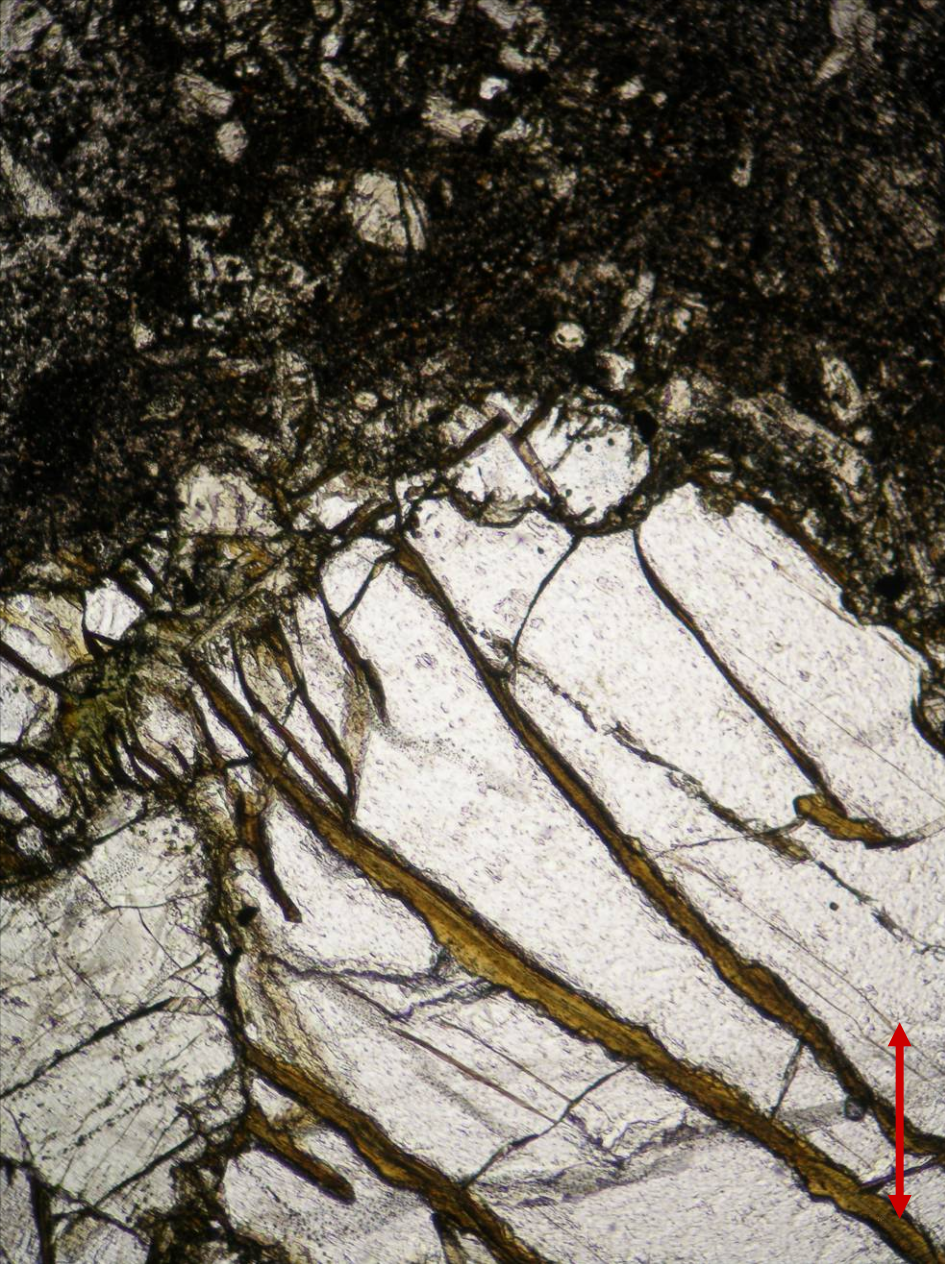
Olivine phenocryst in basanite from Bruntál, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.8 mm. Photo: JiZi.



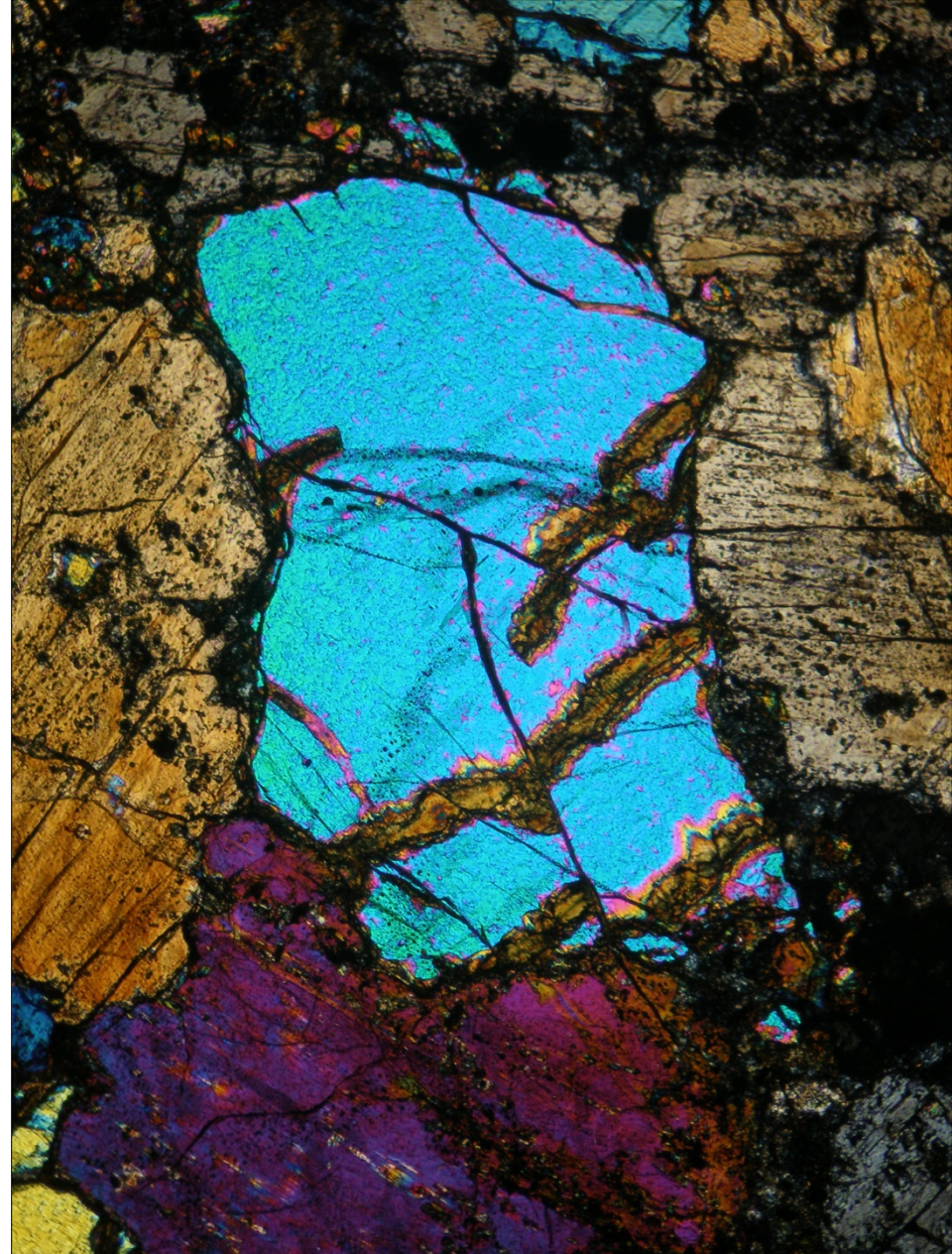
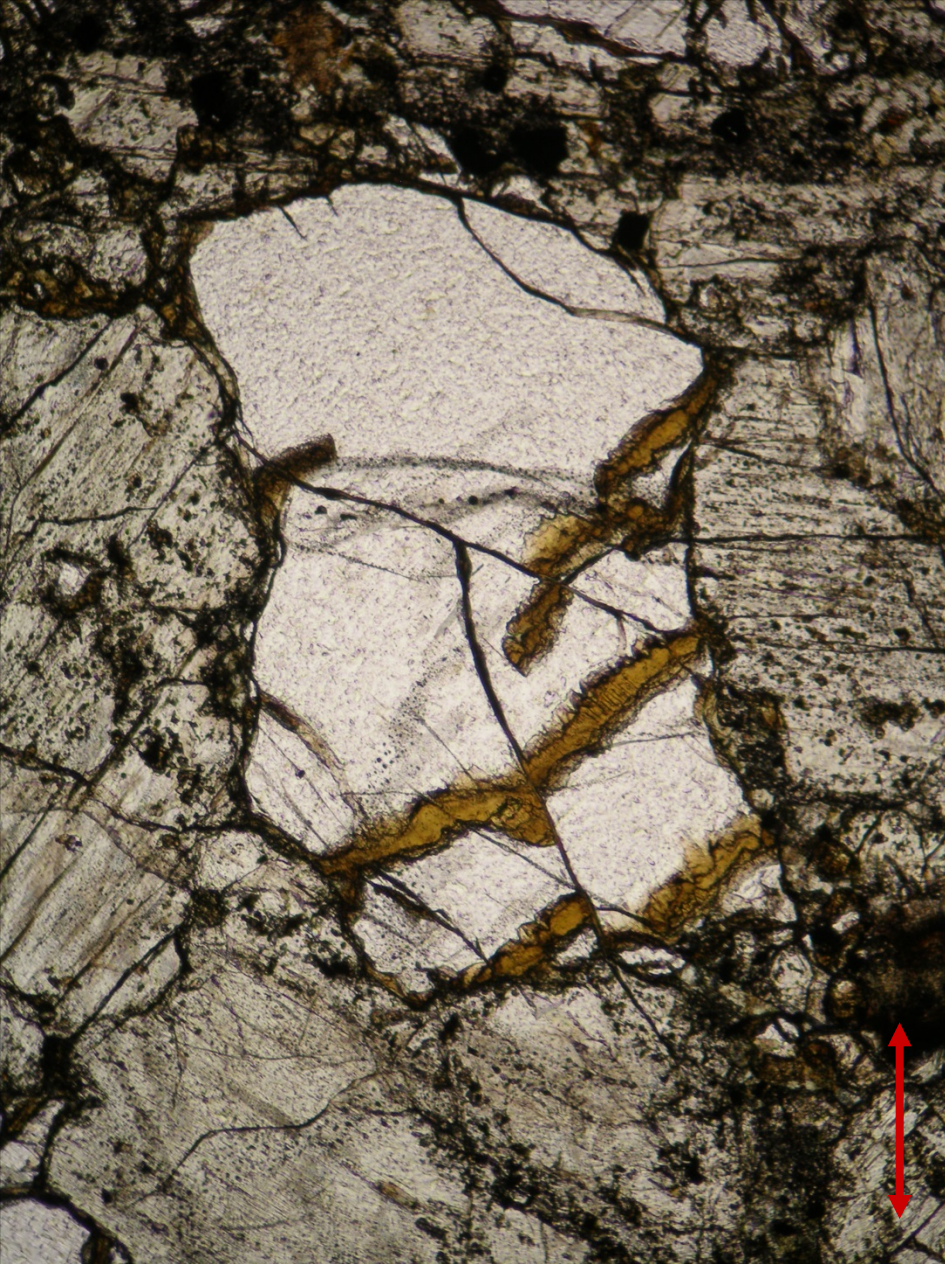
Olivine phenocrysts in basanite from Zálesí, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2.4 mm. Photo: JiZi.



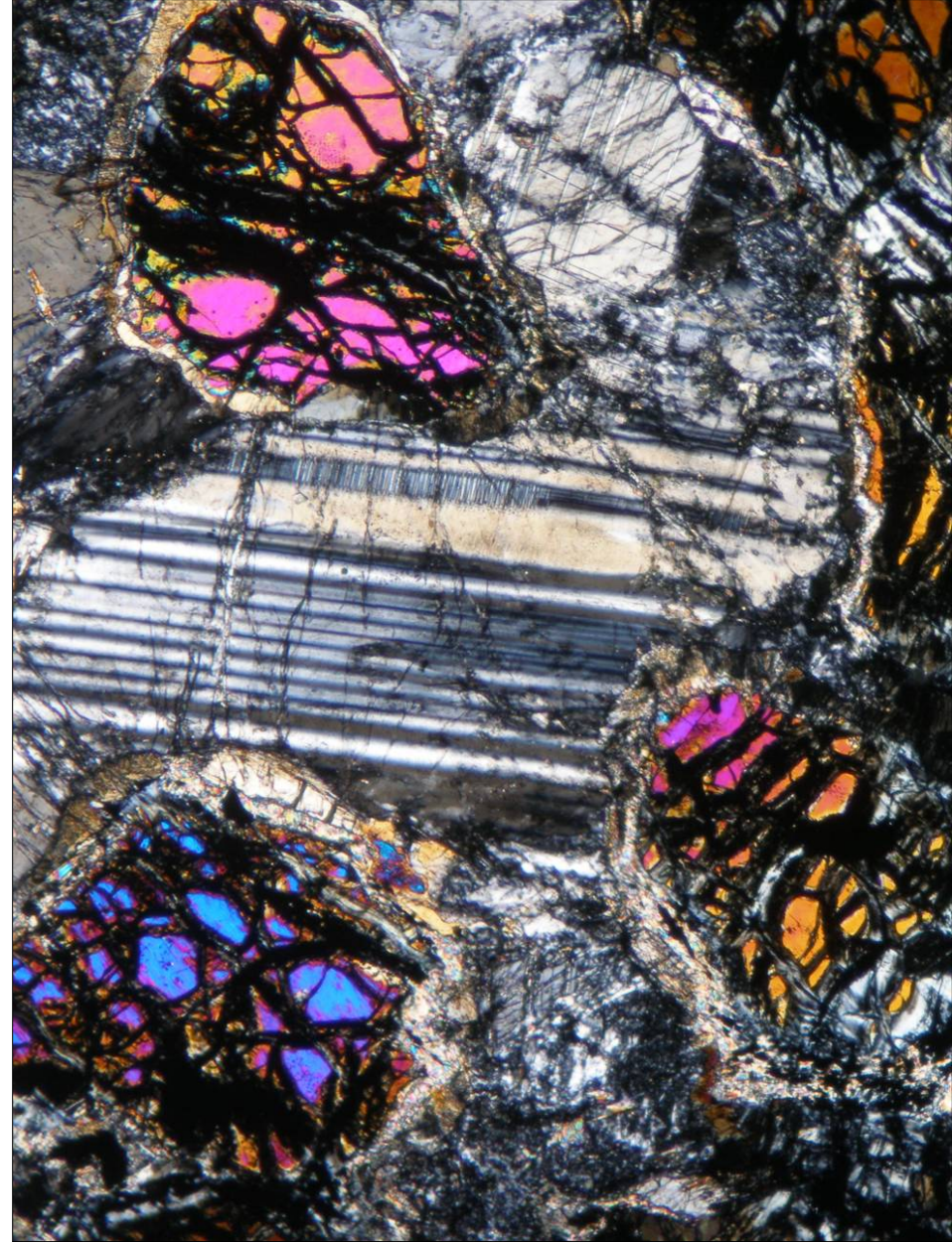
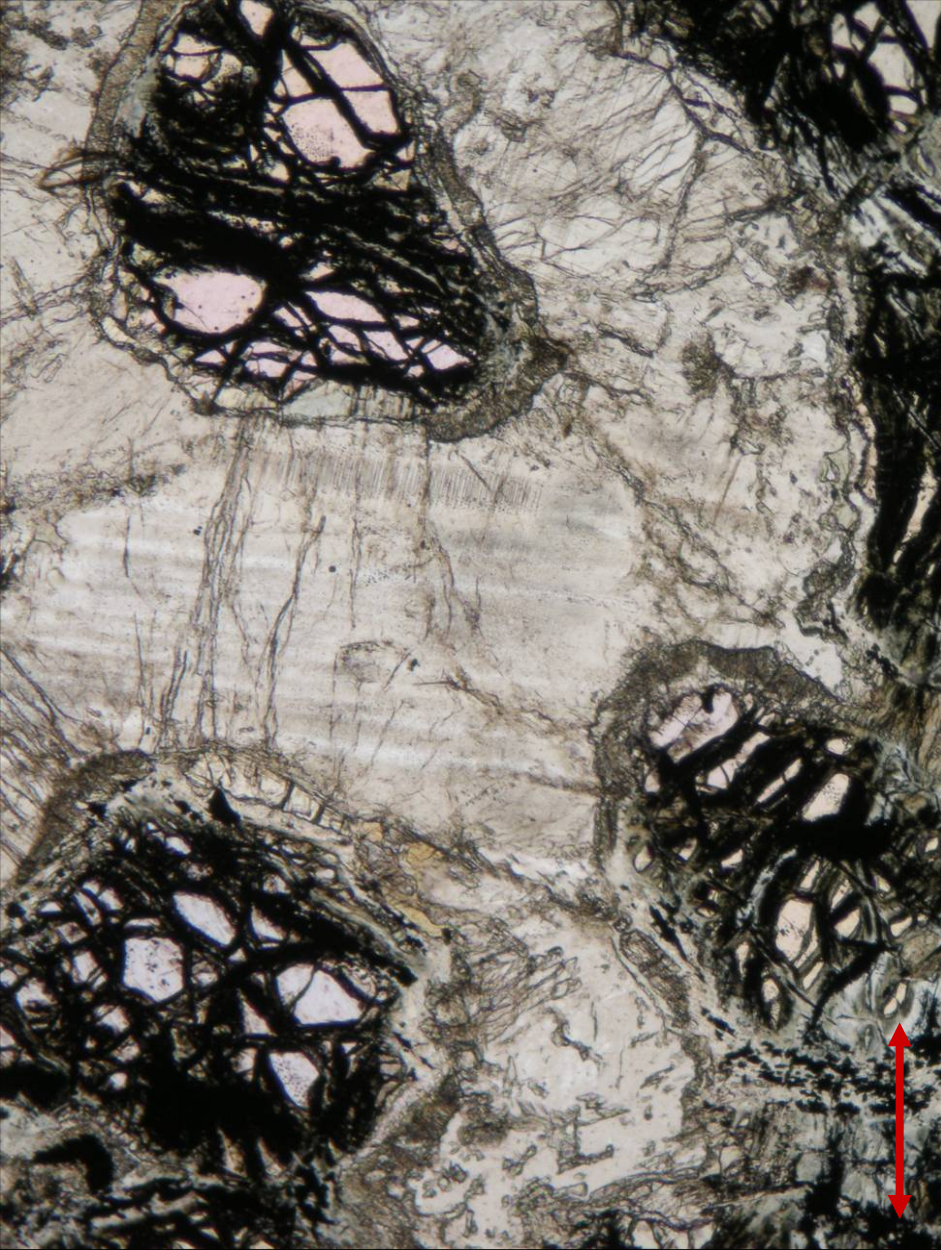
Olivine in phonolite from Třebenice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.



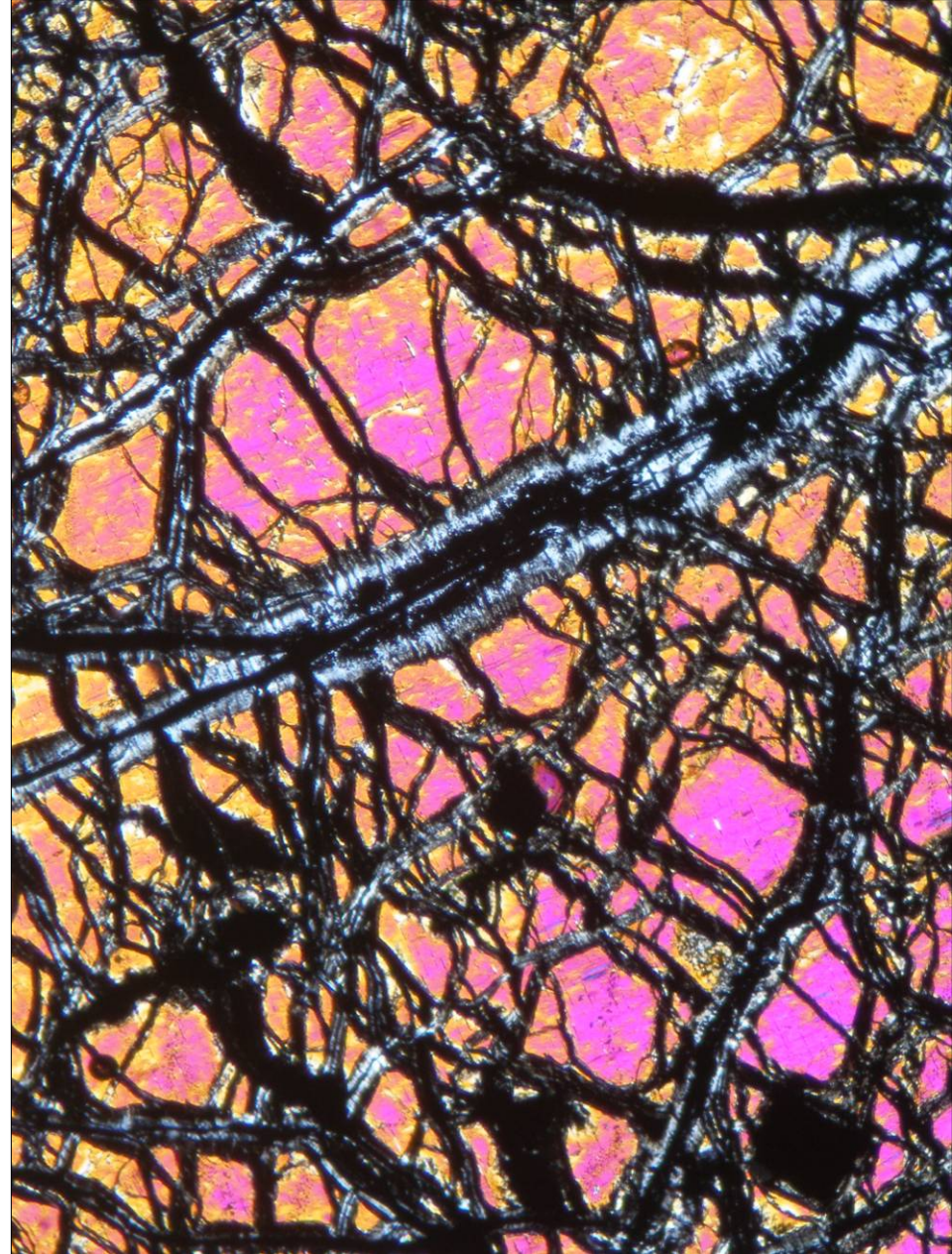
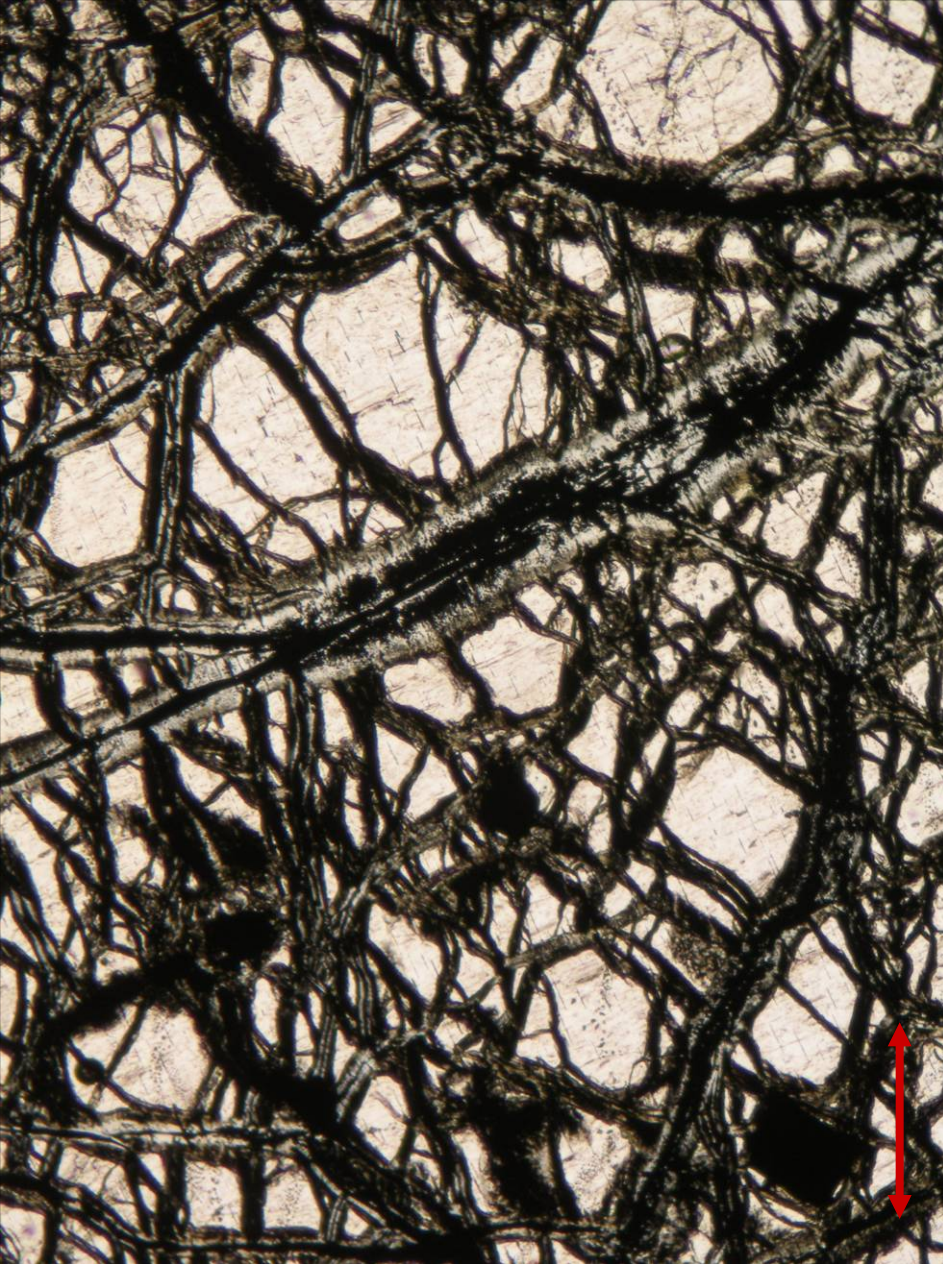
Olivine in phonolite from Třebenice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.



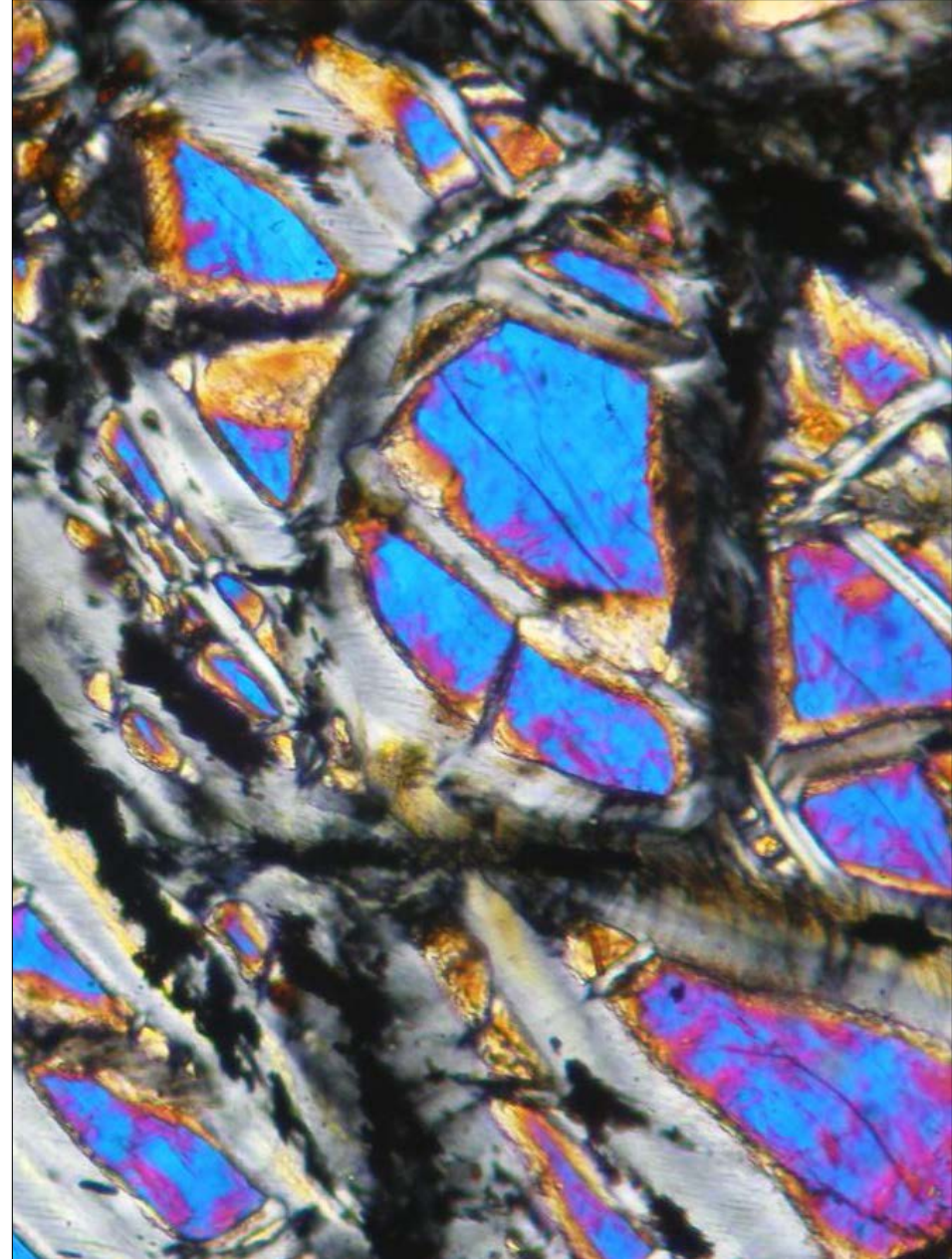
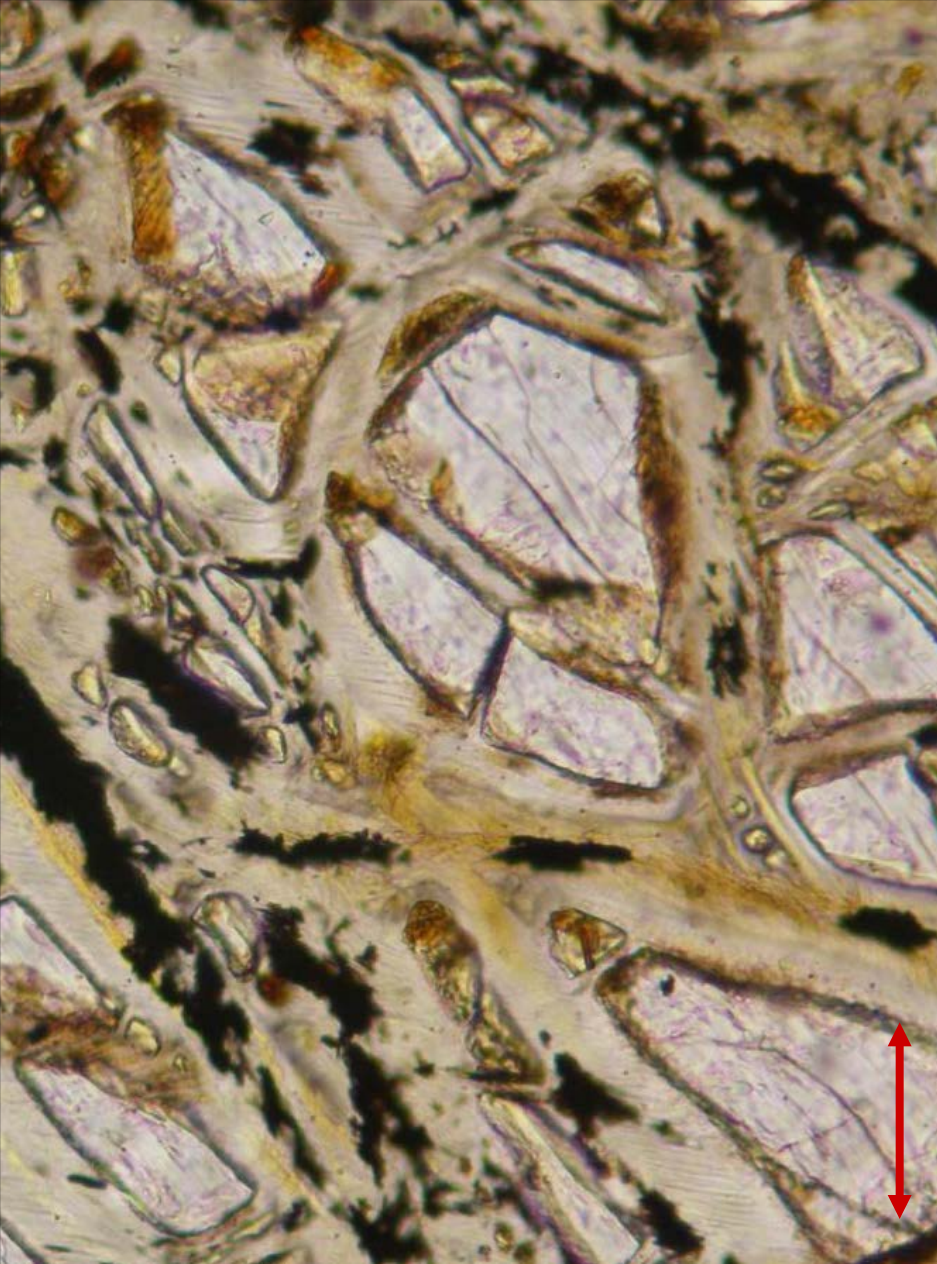
Olivine and pyroxene in peridotite to pyroxenite from Třebenice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.



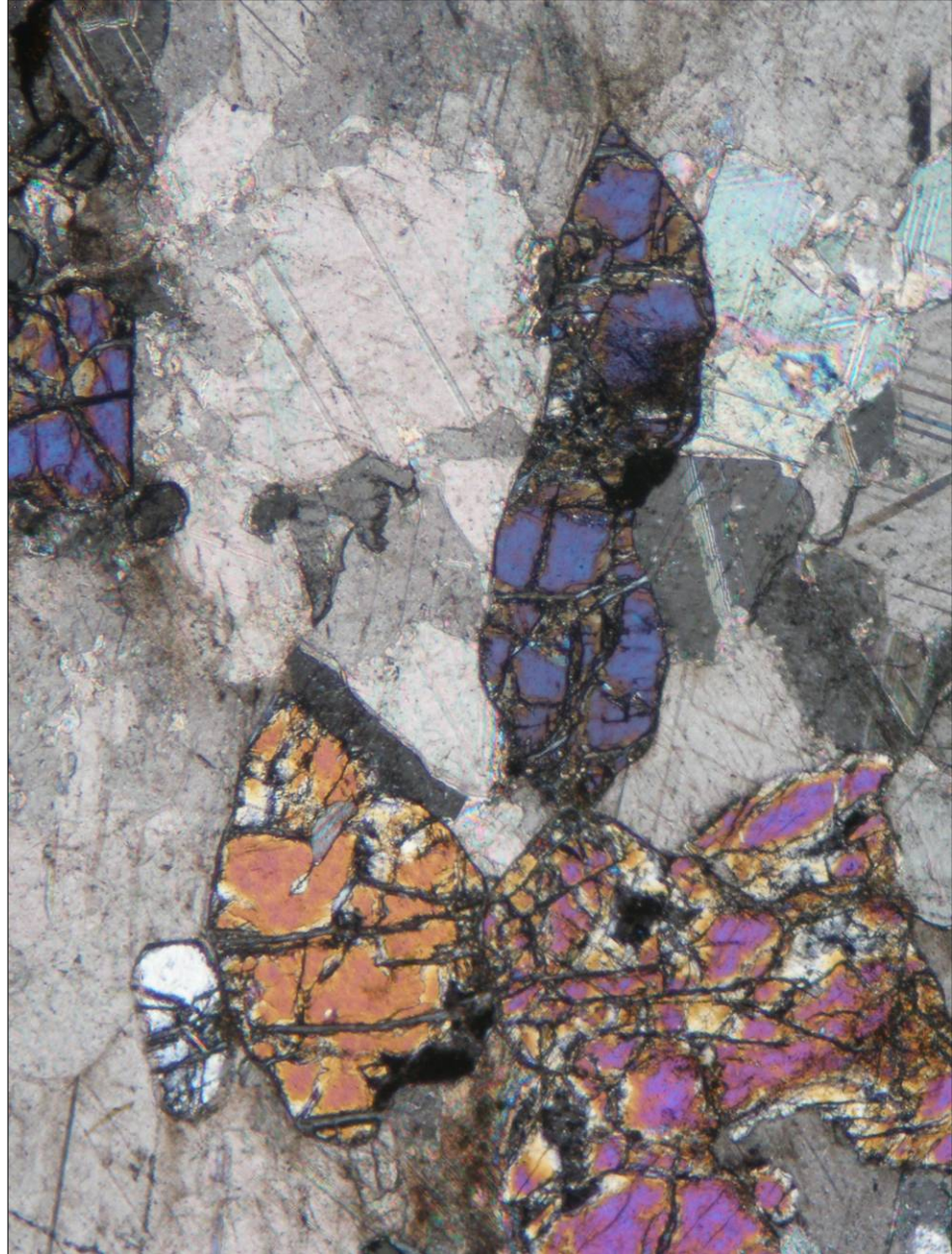
Partly serpentinized olivine mantled by kelyphitic rims in gabbro (so-called troctolite composed essentially of highly calcic plagioclase and olivine) from Staré Ransko, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.



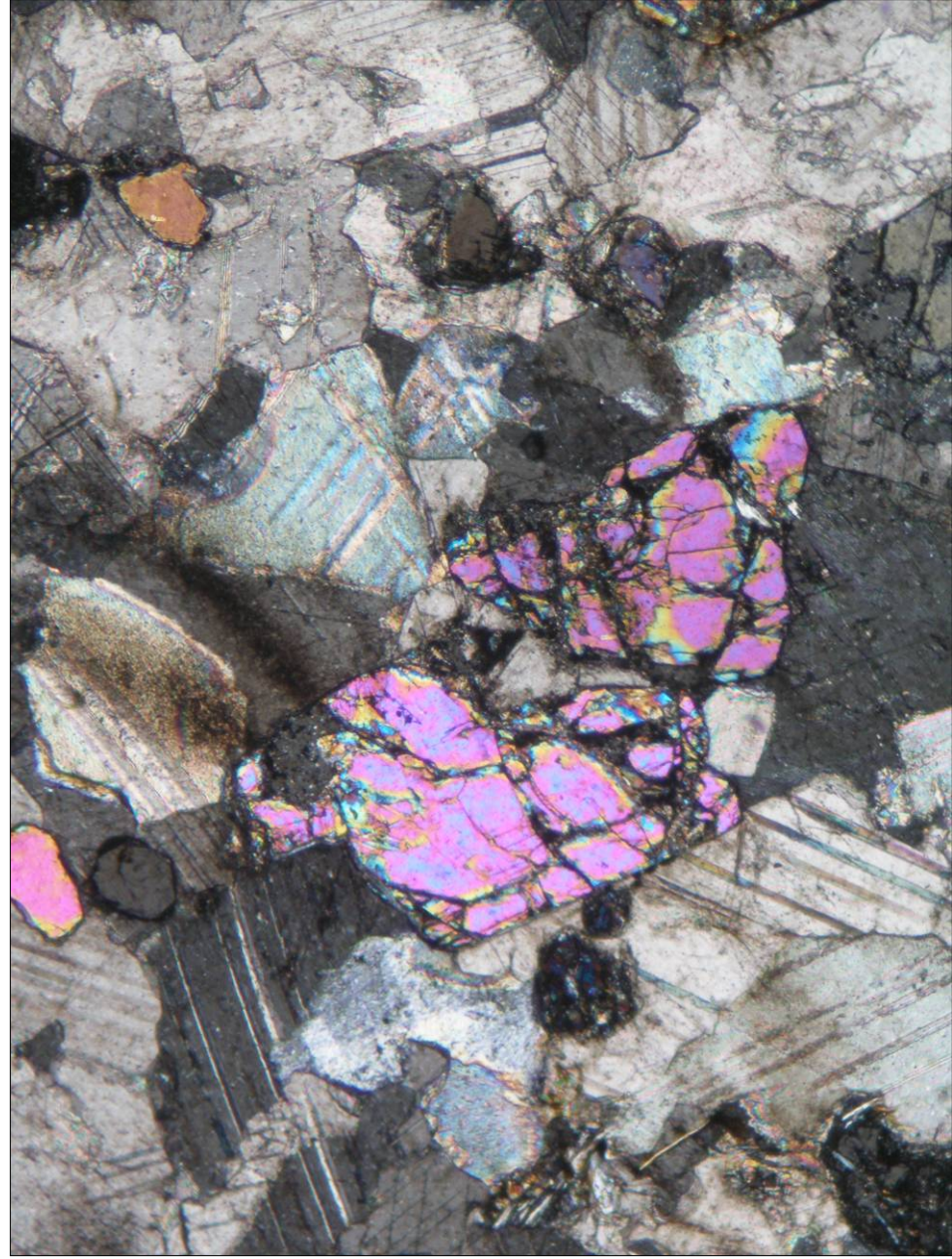
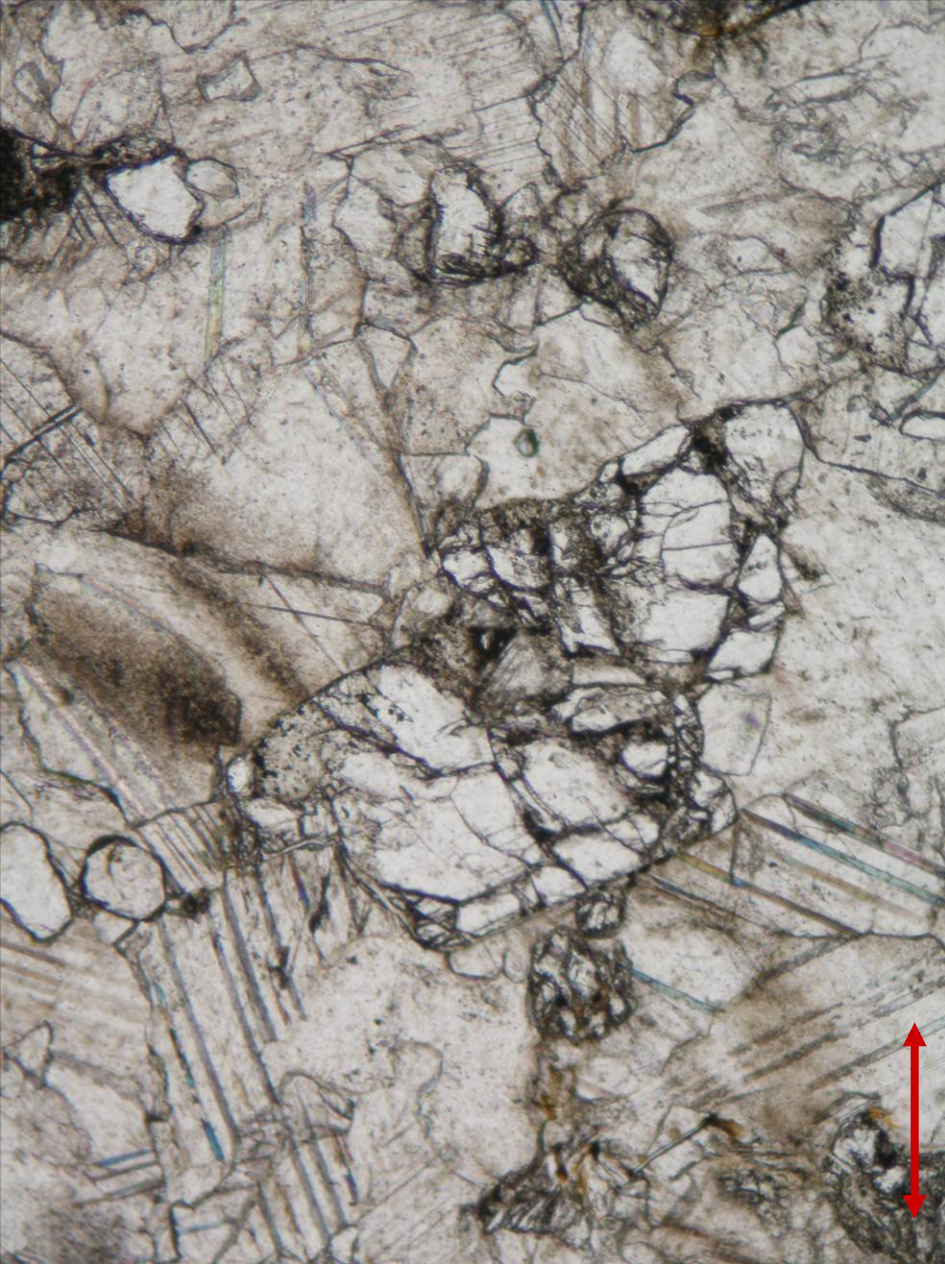
Partly serpentinized olivine in gabbro (troctolite) from Staré Ransko, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.8 mm. Photo: JiZi.



An irregular mesh of serpentine veinlets in olivine in serpentinite from Věžná, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.4 mm. Photo: JiZi.



Olivine (forsterite) in marble from Sokolí, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.5 mm. Photo: JiZi.



Olivine (forsterite) in marble from Sokolí, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.