BIOTITE

Chemical formula: $K(Mg,Fe)_3[(OH,F)_2|AlSi_3O_{10}]$

Crystal system: monoclinic

Color in thin section: distinctly pleochroic with:

X = colorless, light tan, pale green, pale greenish brown
Y = Z = brown, green-brown, dark green, dark red-brown

Form: micaceous flakes or tablets with irregular outlines, rarely tabular crystals with hexagonal outline

Cleavage: perfect on {001}

Indices of refraction: $n_\alpha = 1.565 – 1.625$ $n_\beta = 1.612 – 1.696$ $n_\gamma = 1.612 – 1.696$

Birefringence: 0.047 – 0.071

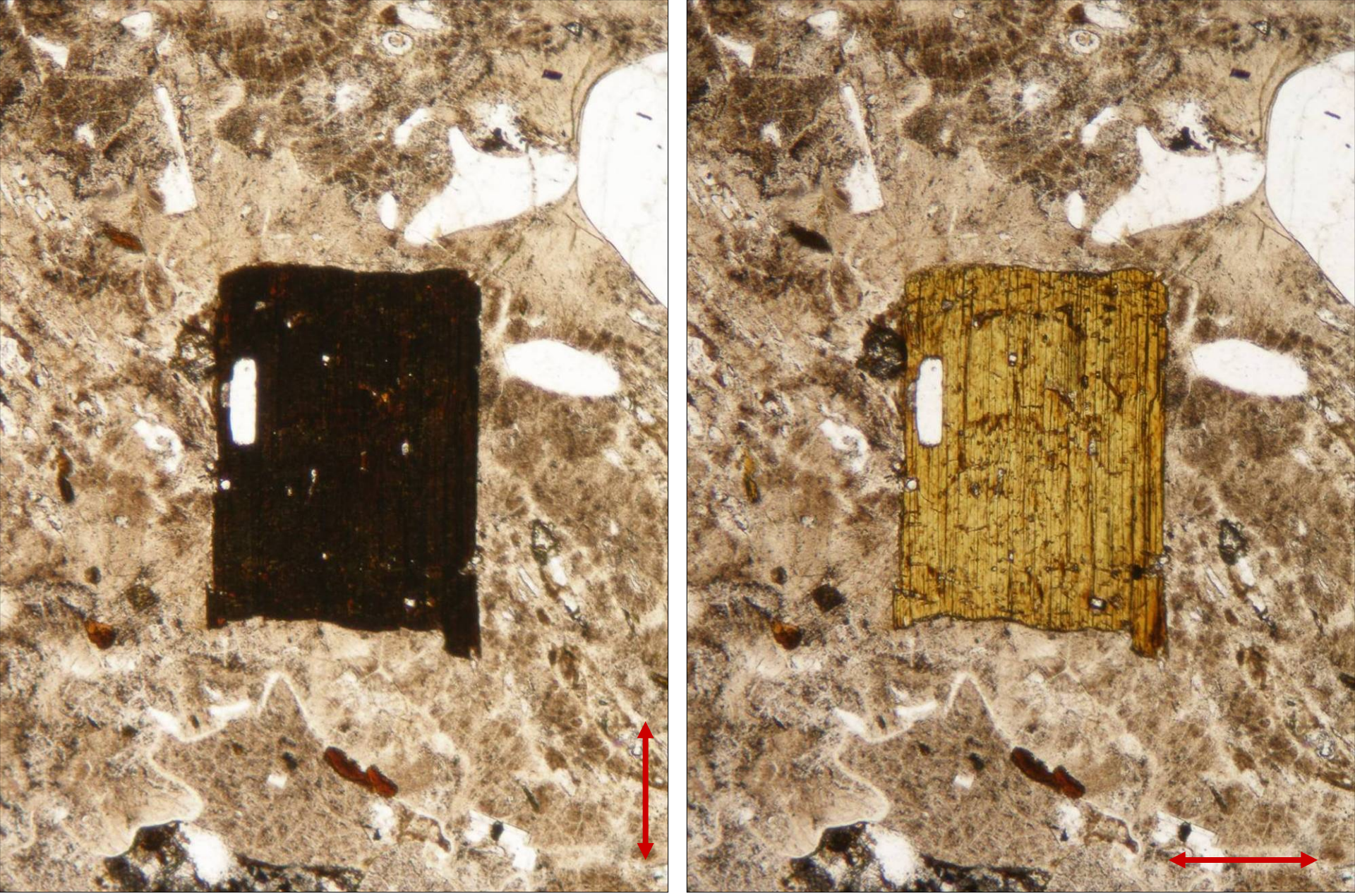
Optic sign: biaxial negative

Sign of elongation: positive

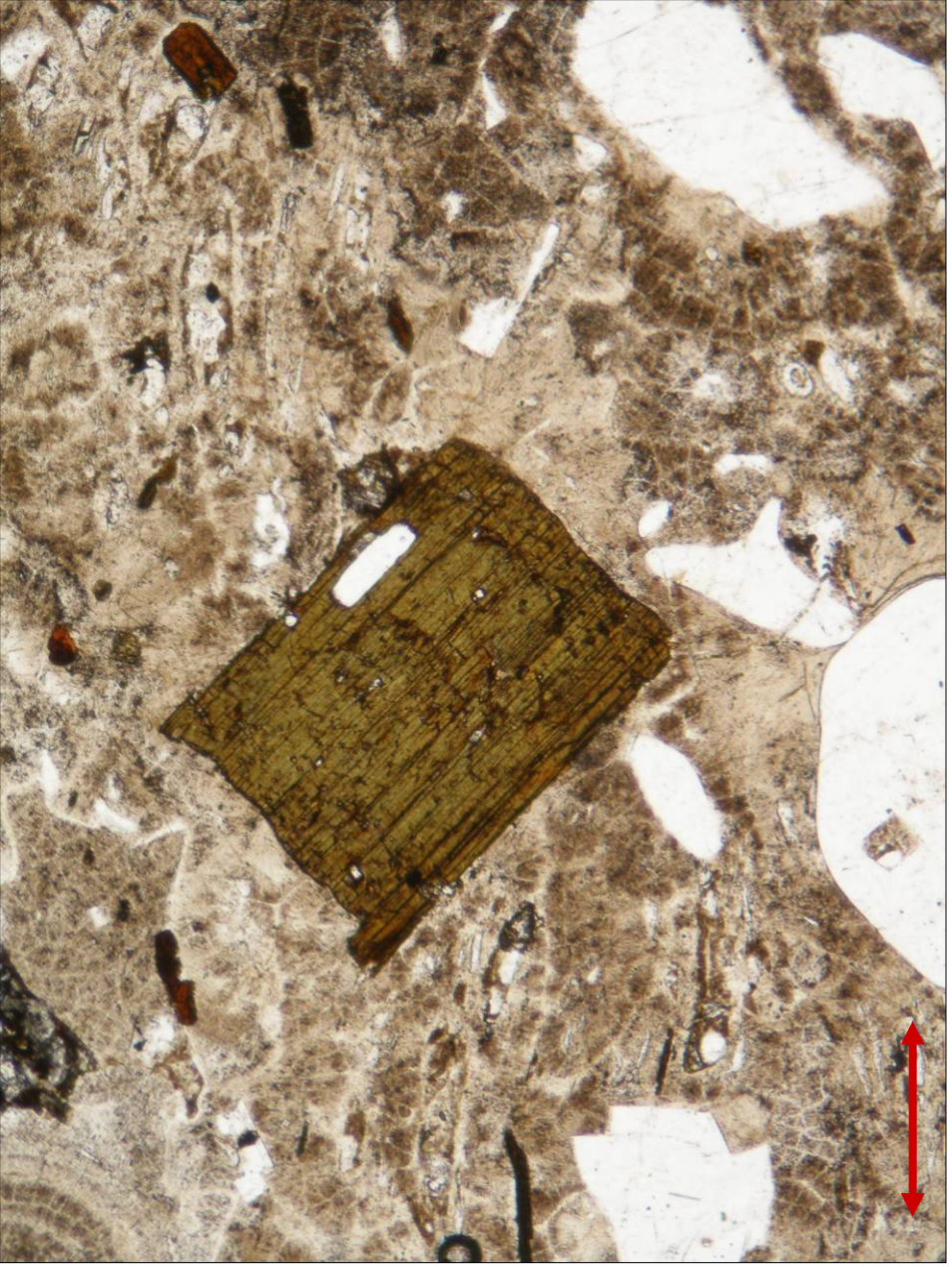
Alteration: often altered to chlorite or clay minerals; other products of the breakdown of biotite are fine-grained muscovite (sericite), oxides of Fe and Ti (e.g., rutile), epidote, and calcite

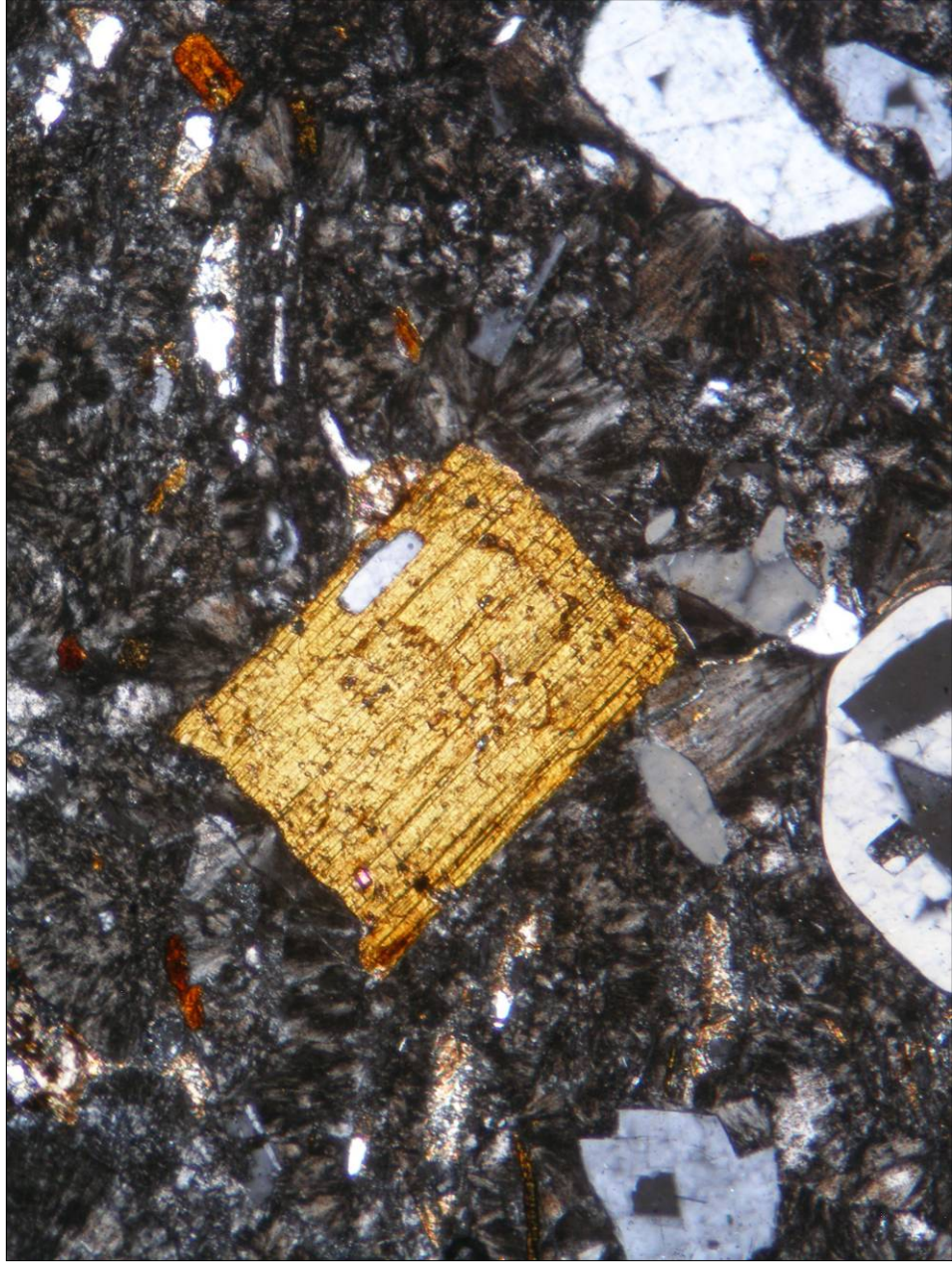
Occurrence: magmatites (granite, granodiorite, diorite, granitic pegmatite), metamorphic rocks (mica schist, gneiss)

Similar minerals in thin sections: schorl (it has different absorption – elongate schorl crystals are darkest when their long dimension is aligned perpendicular to the vibration direction of the lower polar), amphibole (different cleavage)

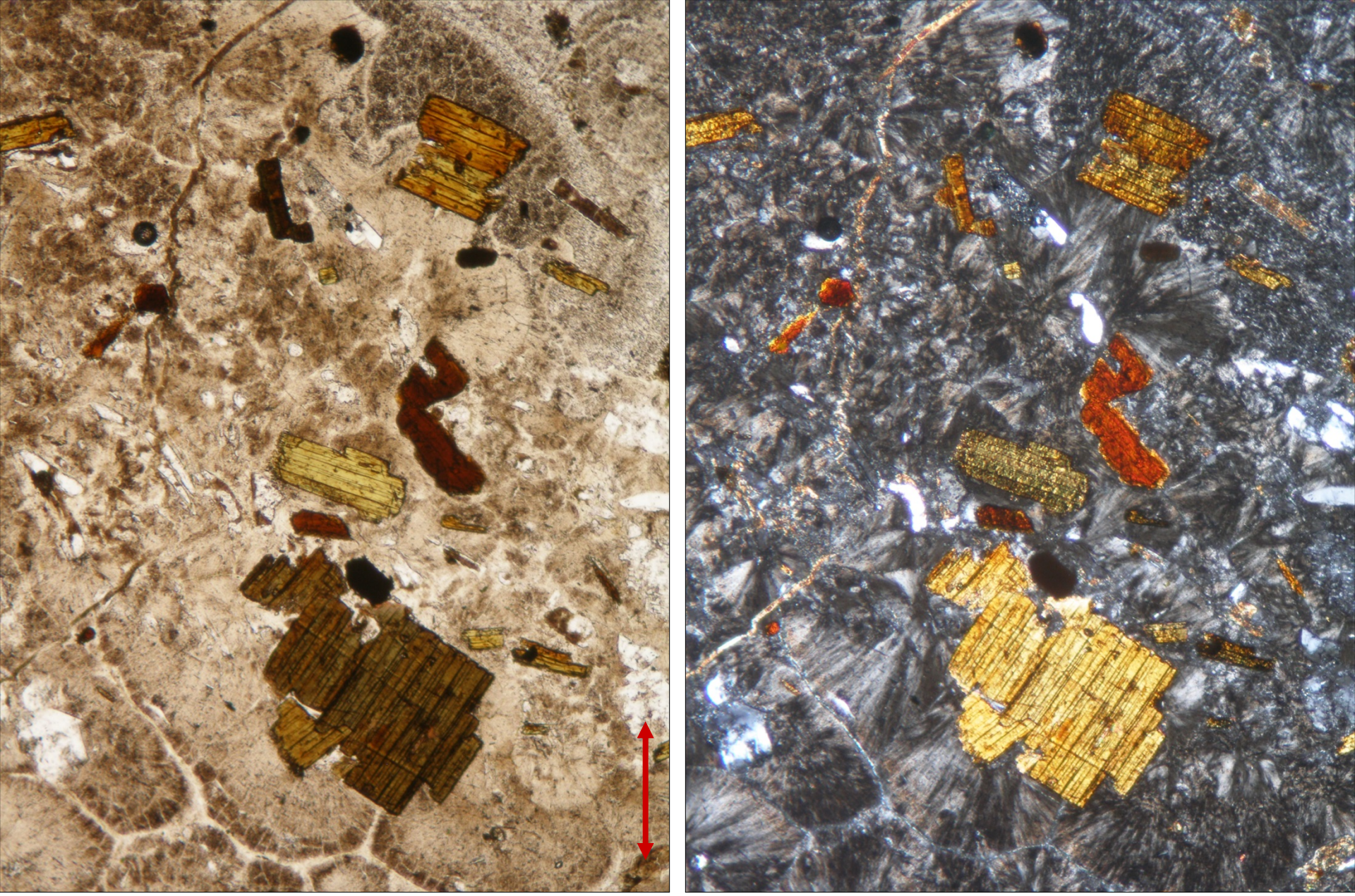


Pleochroism of biotite in rhyolite from Gleichenberg, Germany; PPL. Width of fields of view is ca. 1.3 mm. Photo: JiZi.

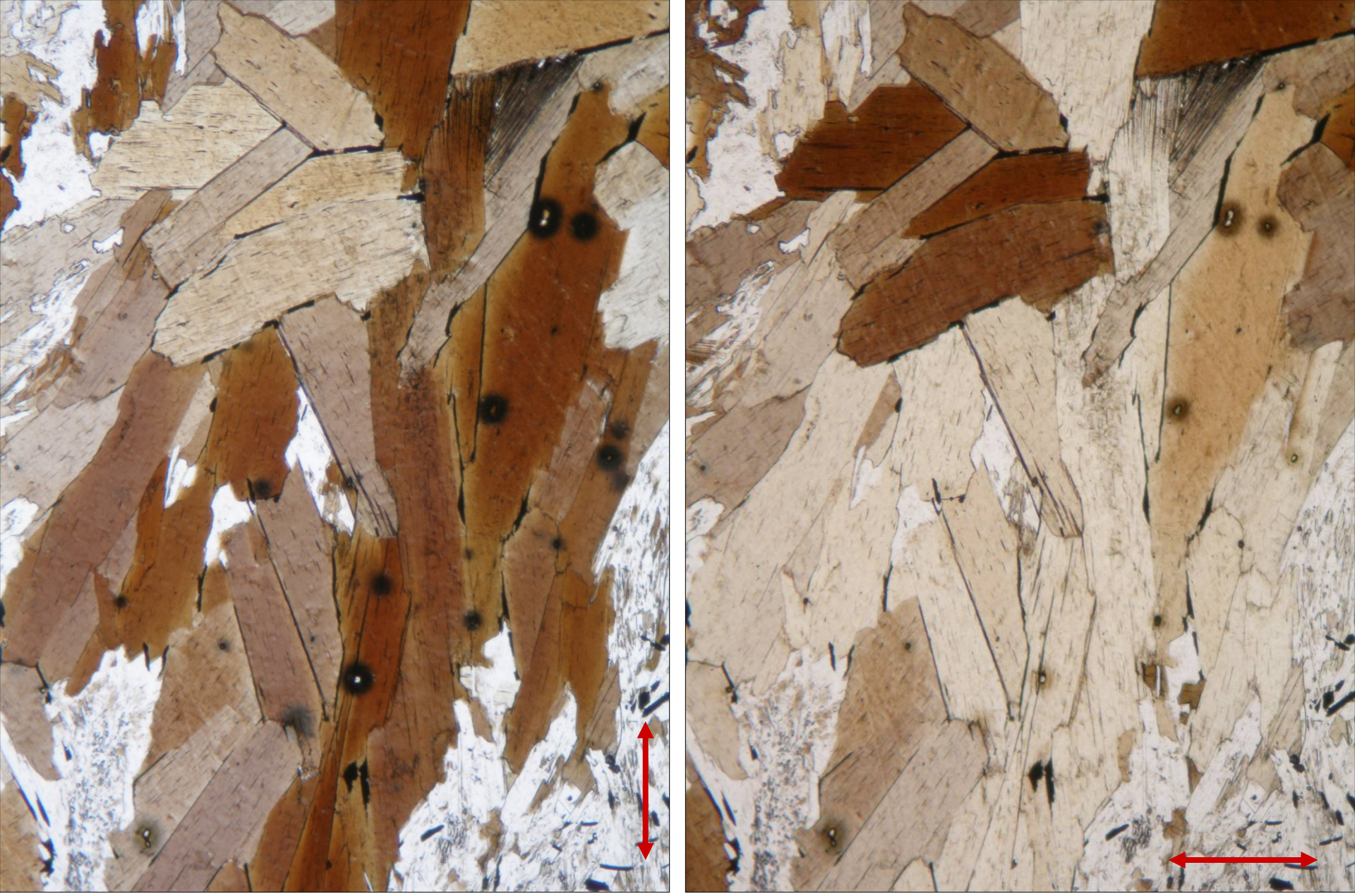




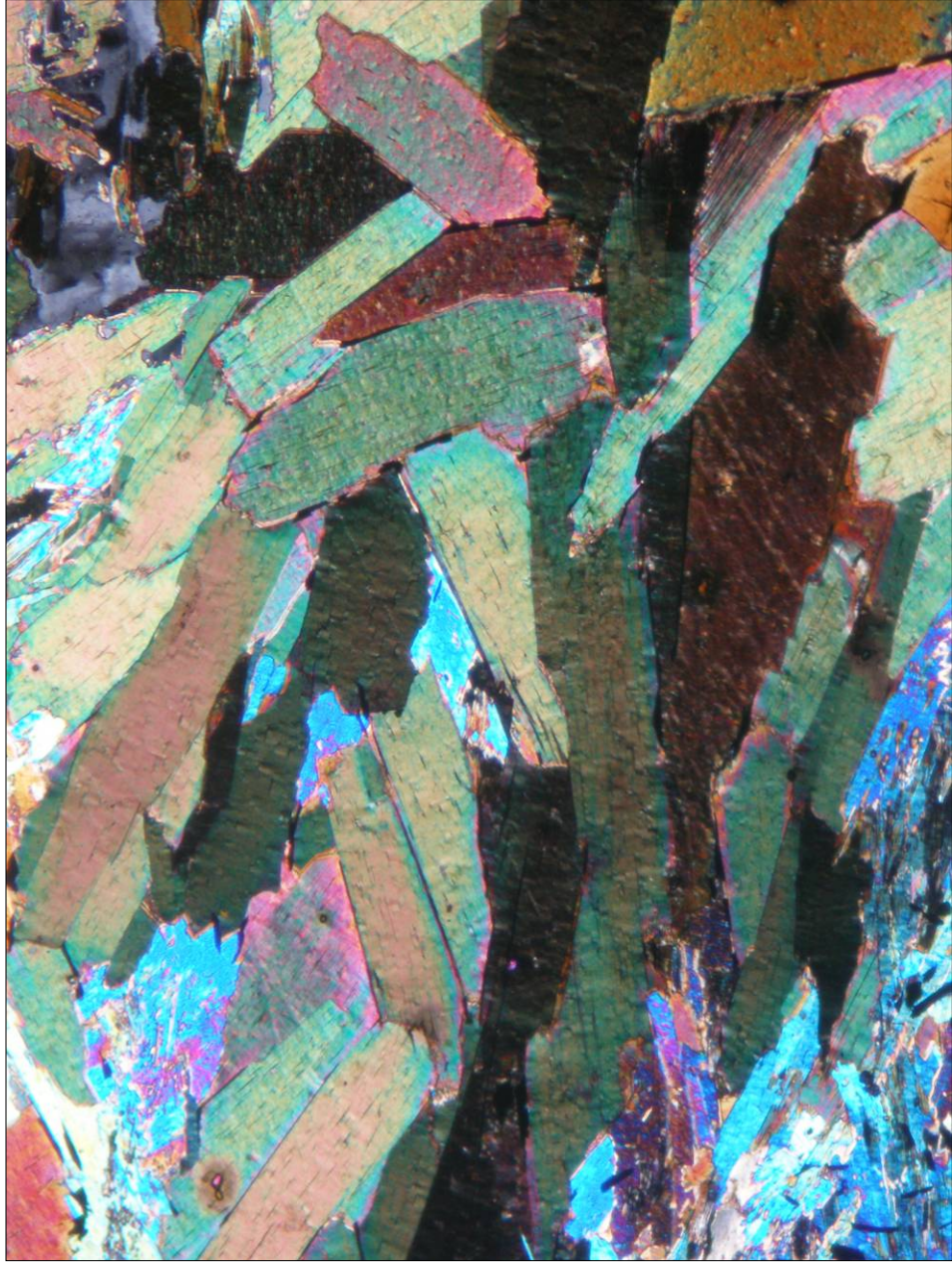
Biotite phenocryst in rhyolite from Gleichenberg, Germany; PPL (left) and XPL (right). Width of fields of view is ca. 1.7 mm. Photo: JiZi.



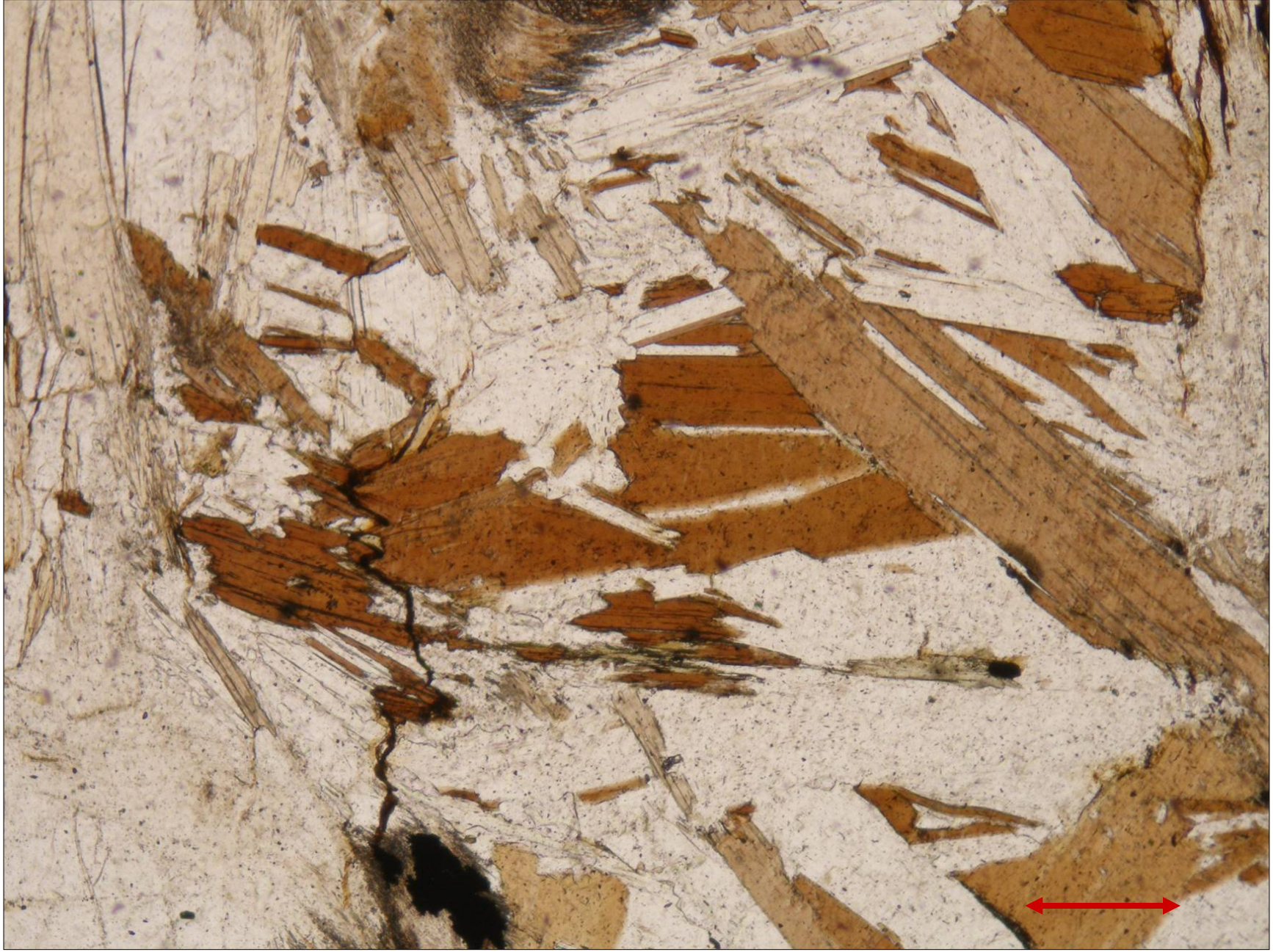
Biotite phenocrysts in rhyolite from Gleichenberg, Germany; PPL (left) and XPL (right). Width of fields of view is ca. 1.7 mm. Photo: JiZi.



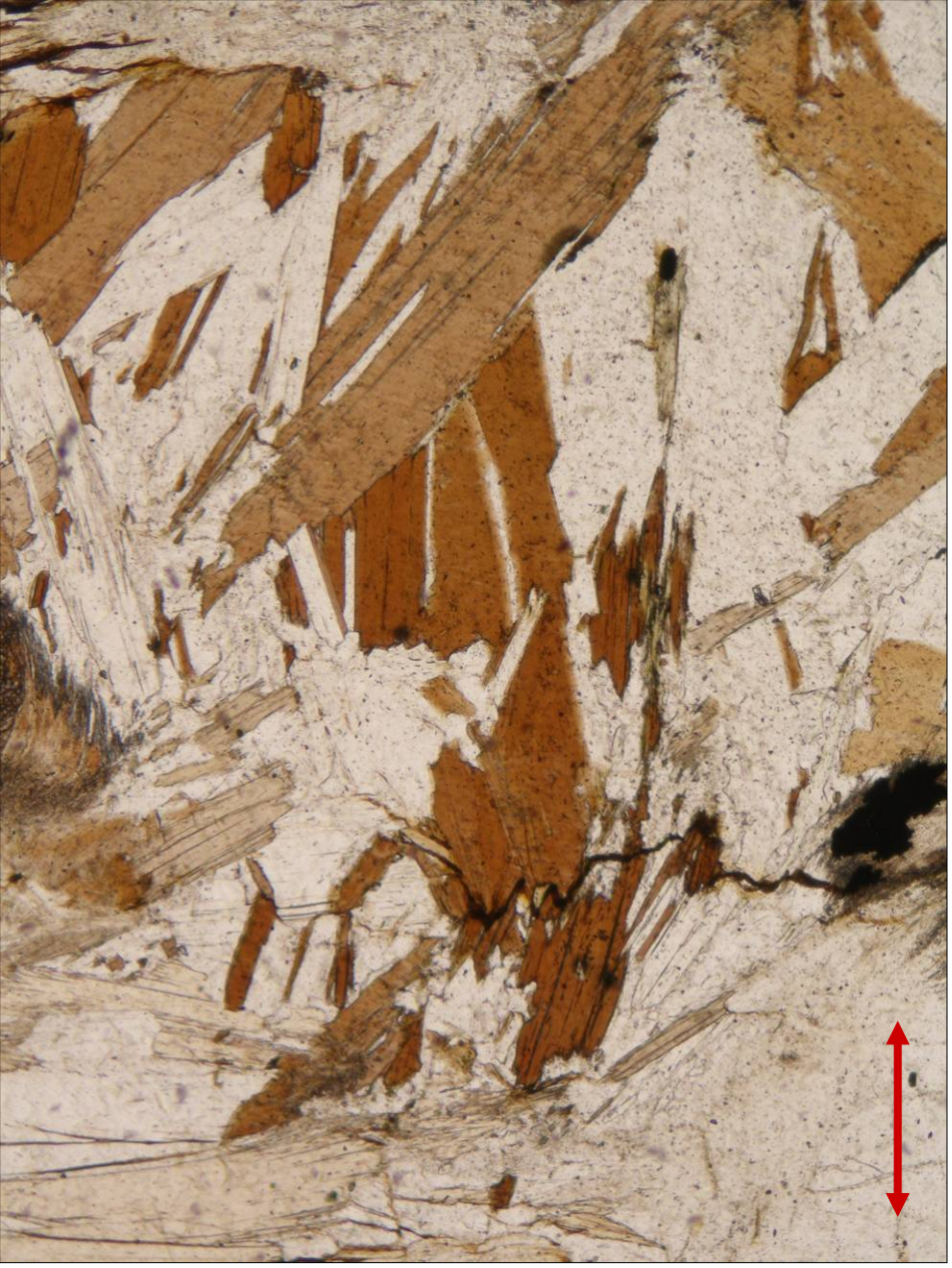
Pleochroism of biotite in gneiss from Žulová, the Czech Republic; PPL. Width of fields of view is ca. 1.8 mm. Photo: JiZi.

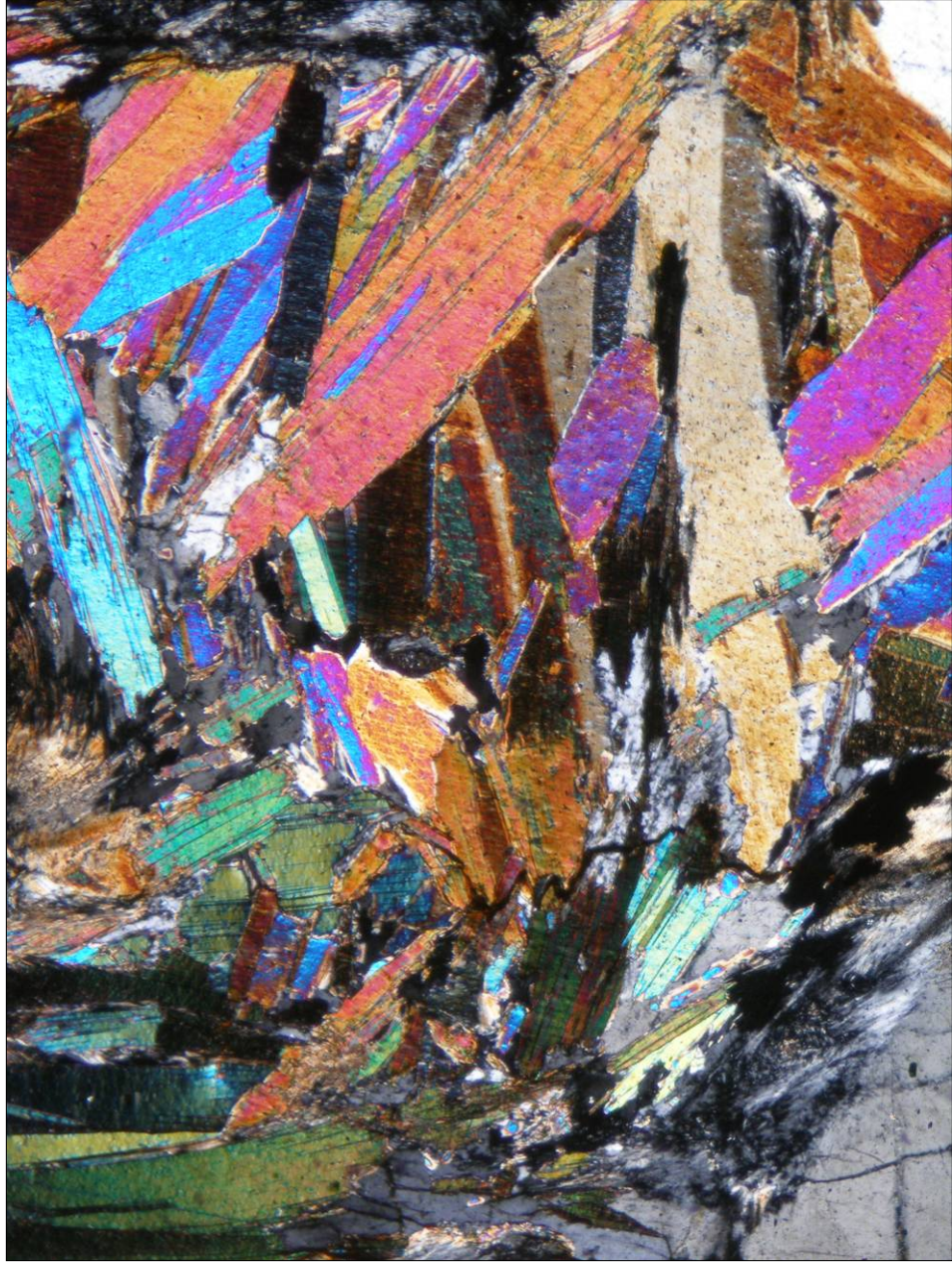


Biotite in gneiss from Žulová, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.

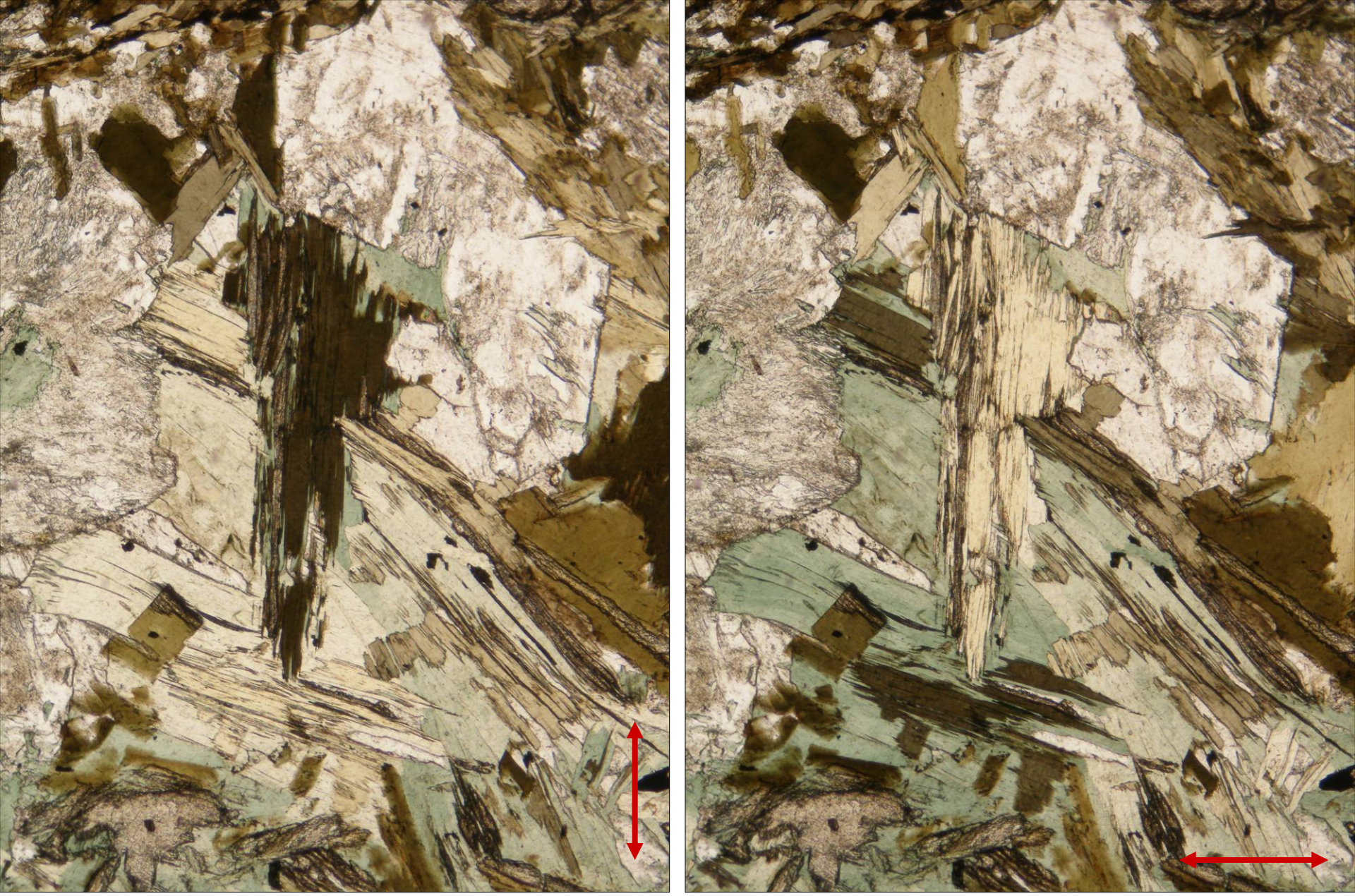


Pleochroism of biotite in mica schist from Štěpánov nad Svratkou, the Czech Republic; PPL. Field of view is ca. 2.0 mm wide. Photo: JiZi.

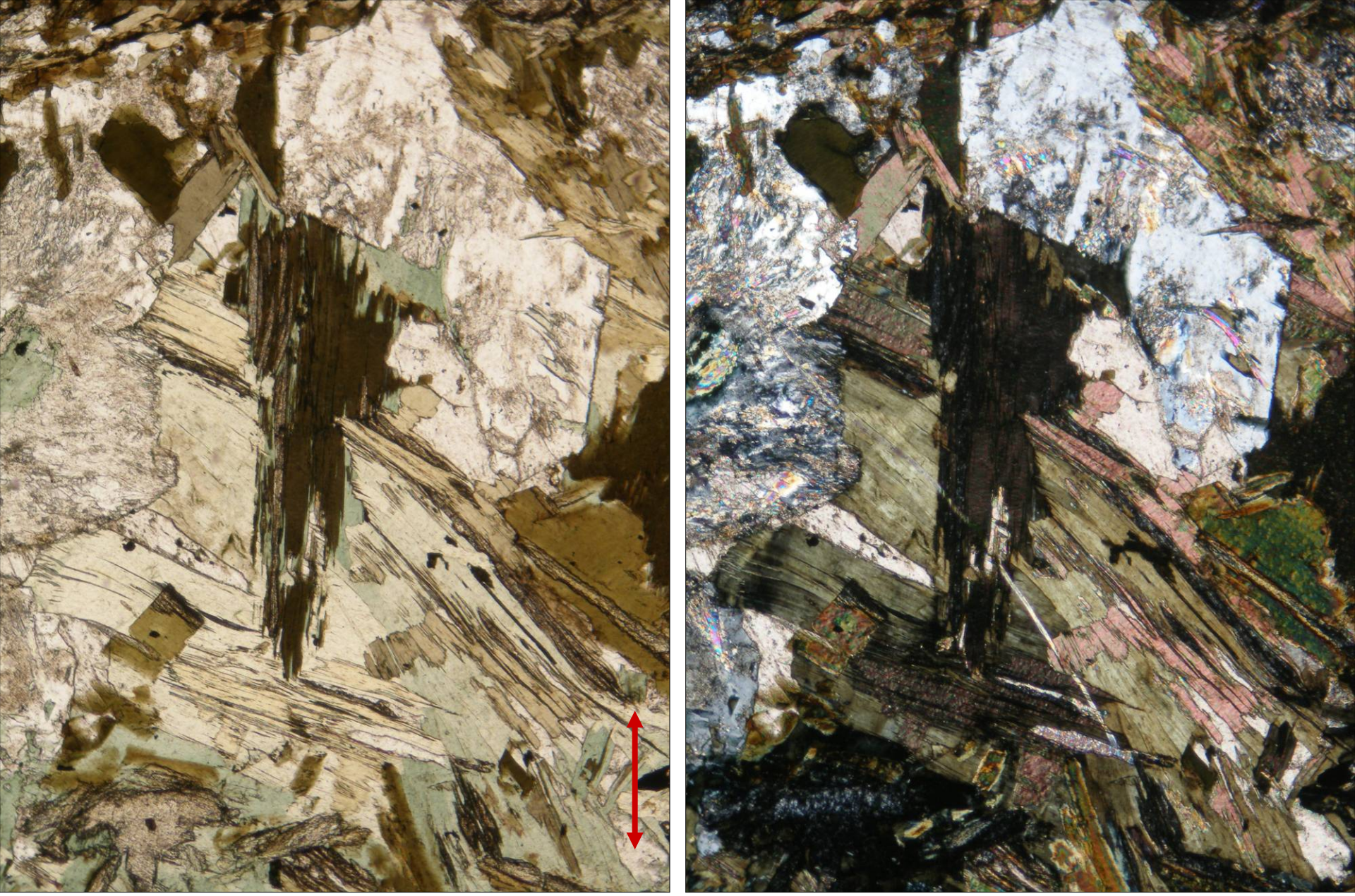




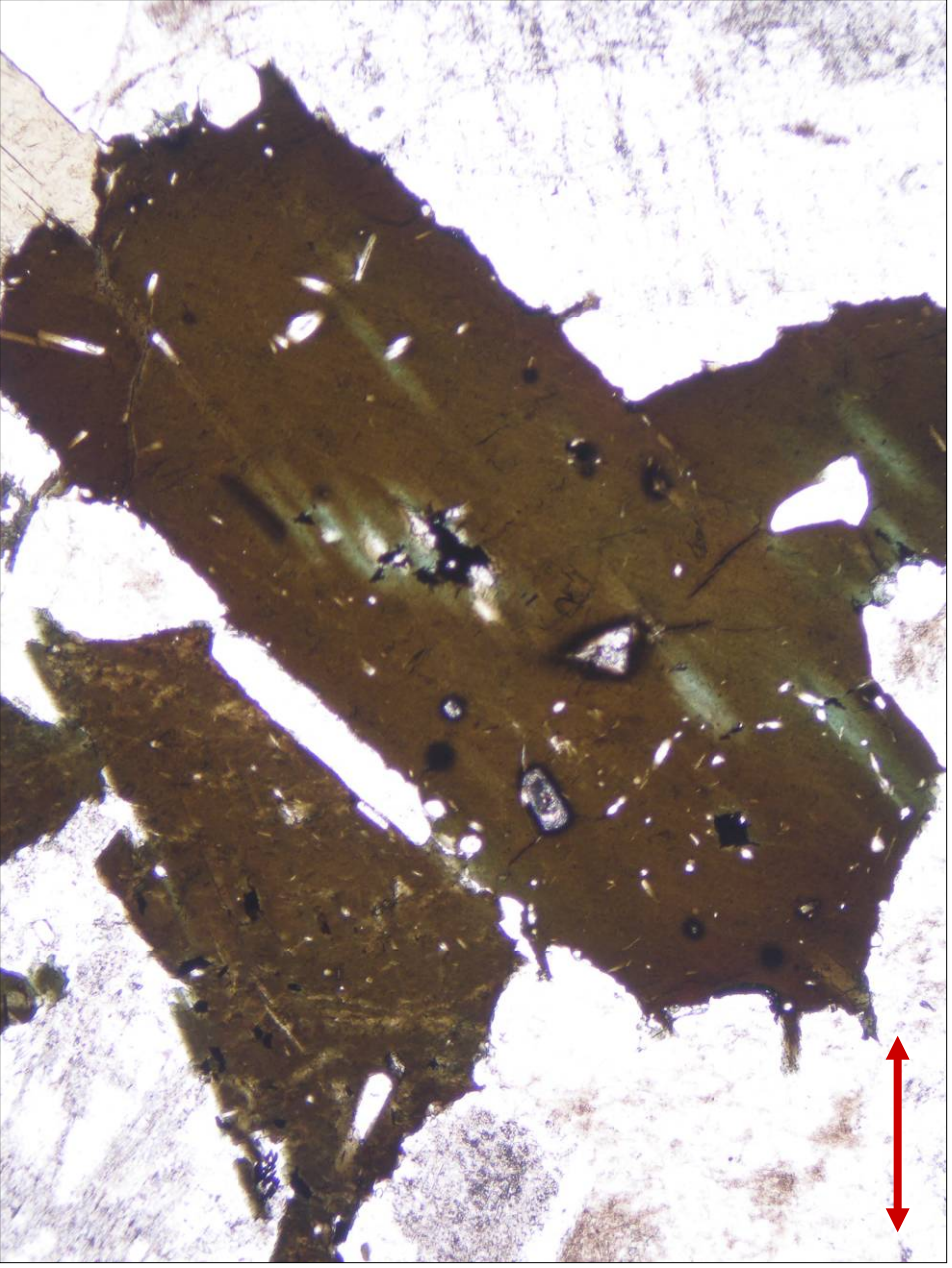
Biotite in mica schist from Štěpánov nad Svratkou, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.5 mm. Photo: JiZi.

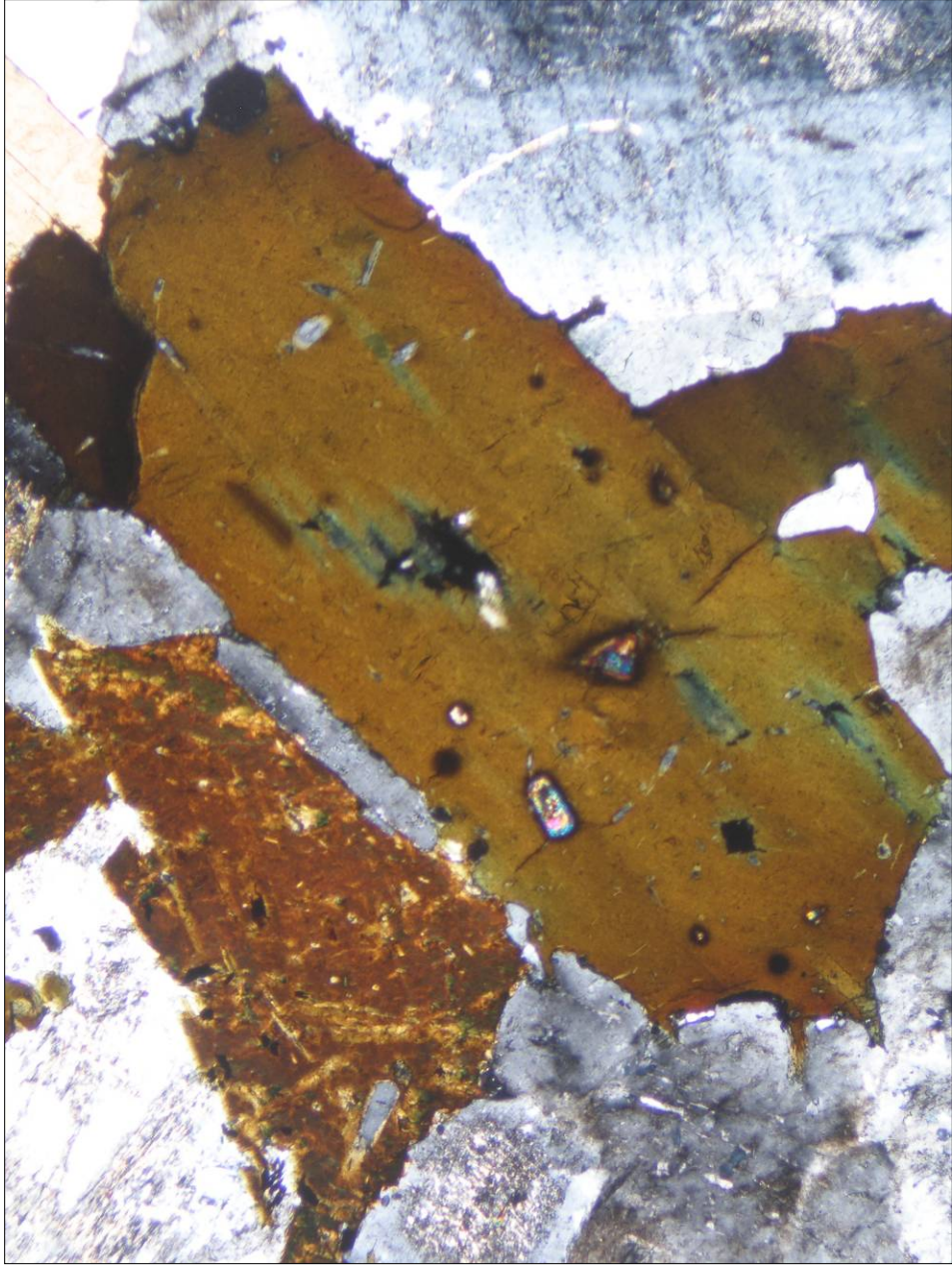


Partly chloritized biotite with strong pleochroism in greenschist from Dolní Údolí, the Czech Republic; PPL. Width of fields of view is ca. 1.8 mm. Photo: JiZi.

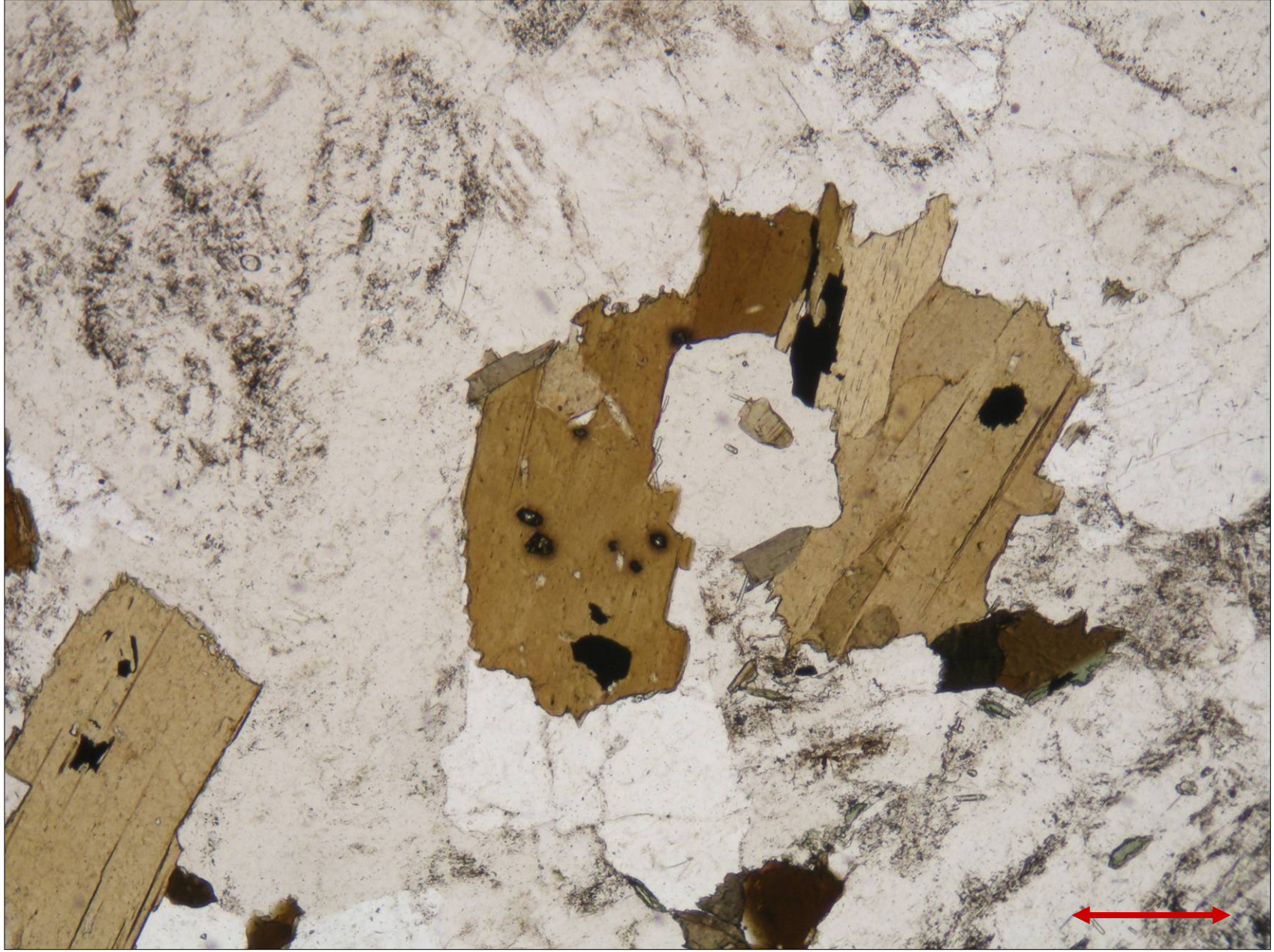


Partly chloritized biotite in greenschist from Dolní Údolí, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.

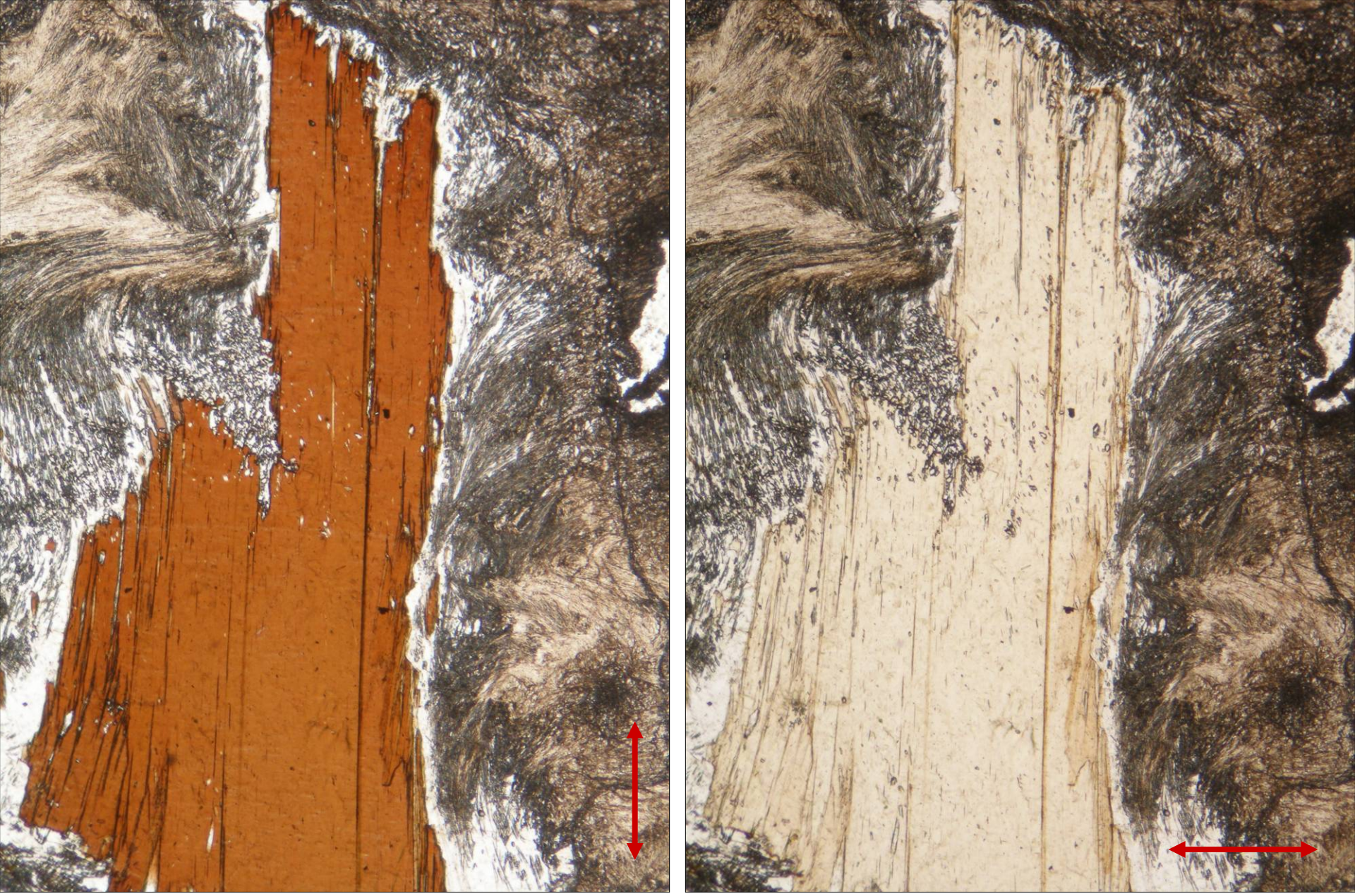




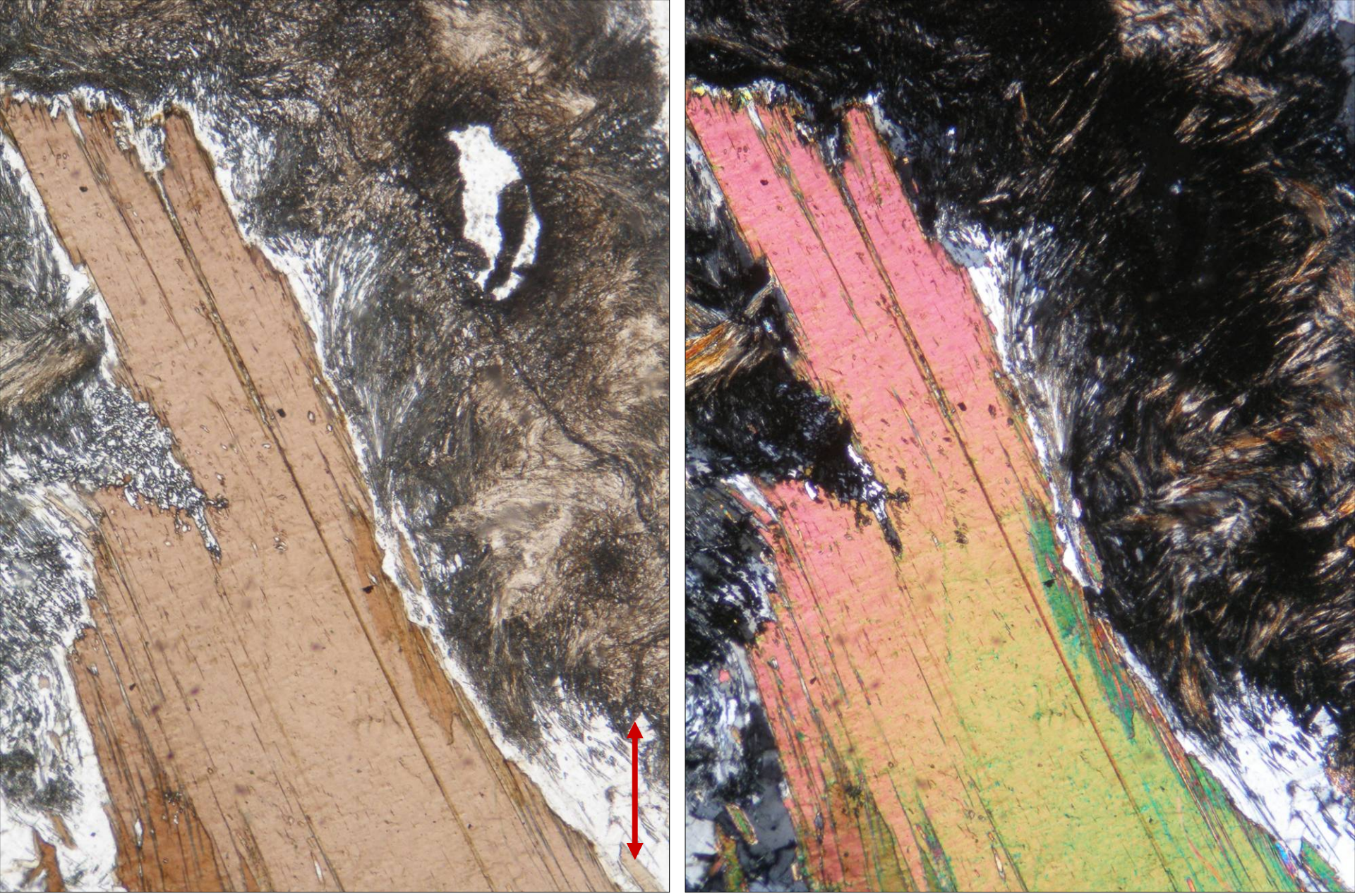
Slightly chloritized biotite with inclusions of apatite and zircon in granite from Liberec, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.5 mm. Photo: JiZi.



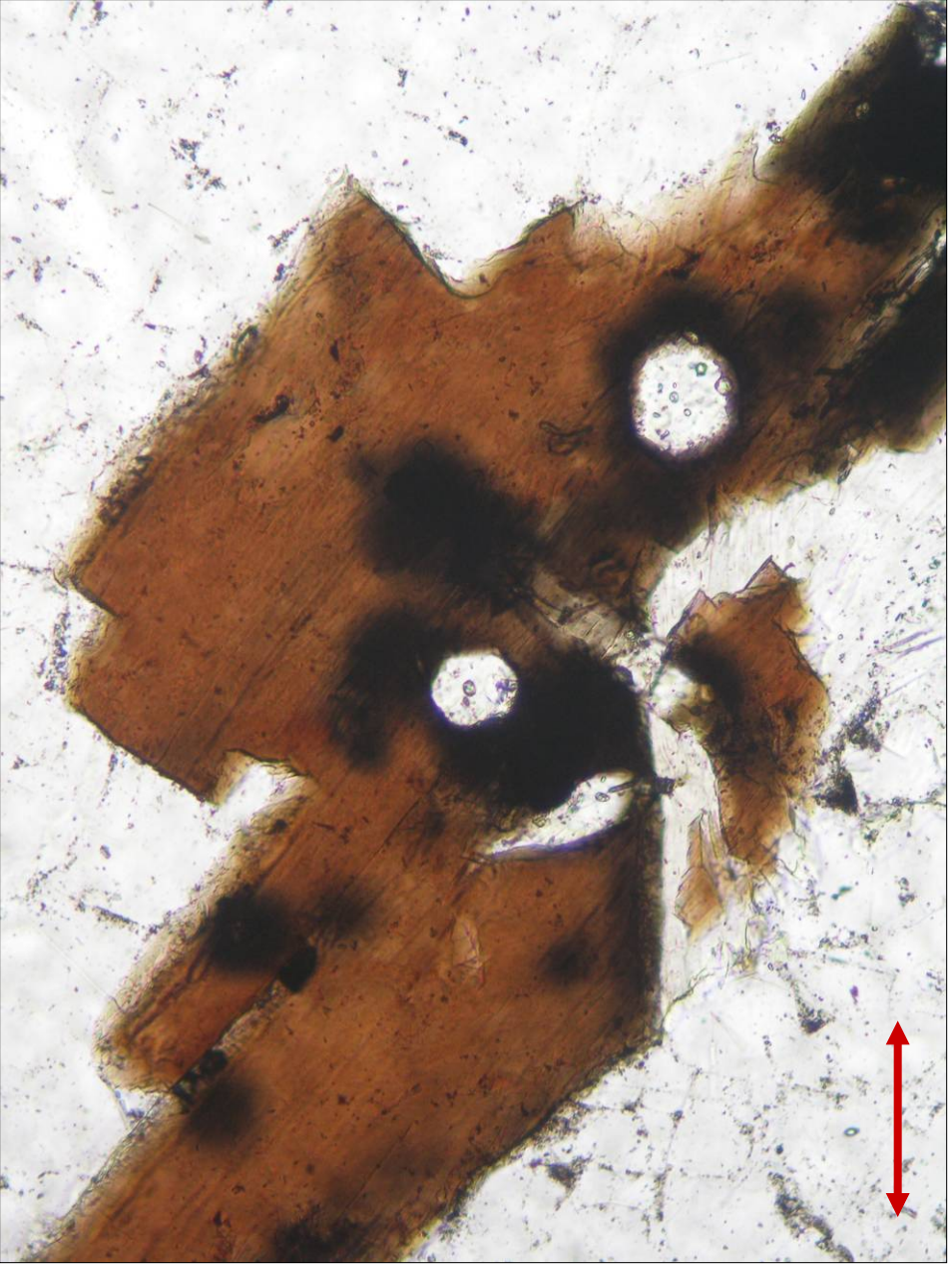
Biotite with dark pleochroic halos around zircon in granite from Černá Voda, the Czech Republic; PPL. Field of view is 2 mm wide. Photo: JiZi.

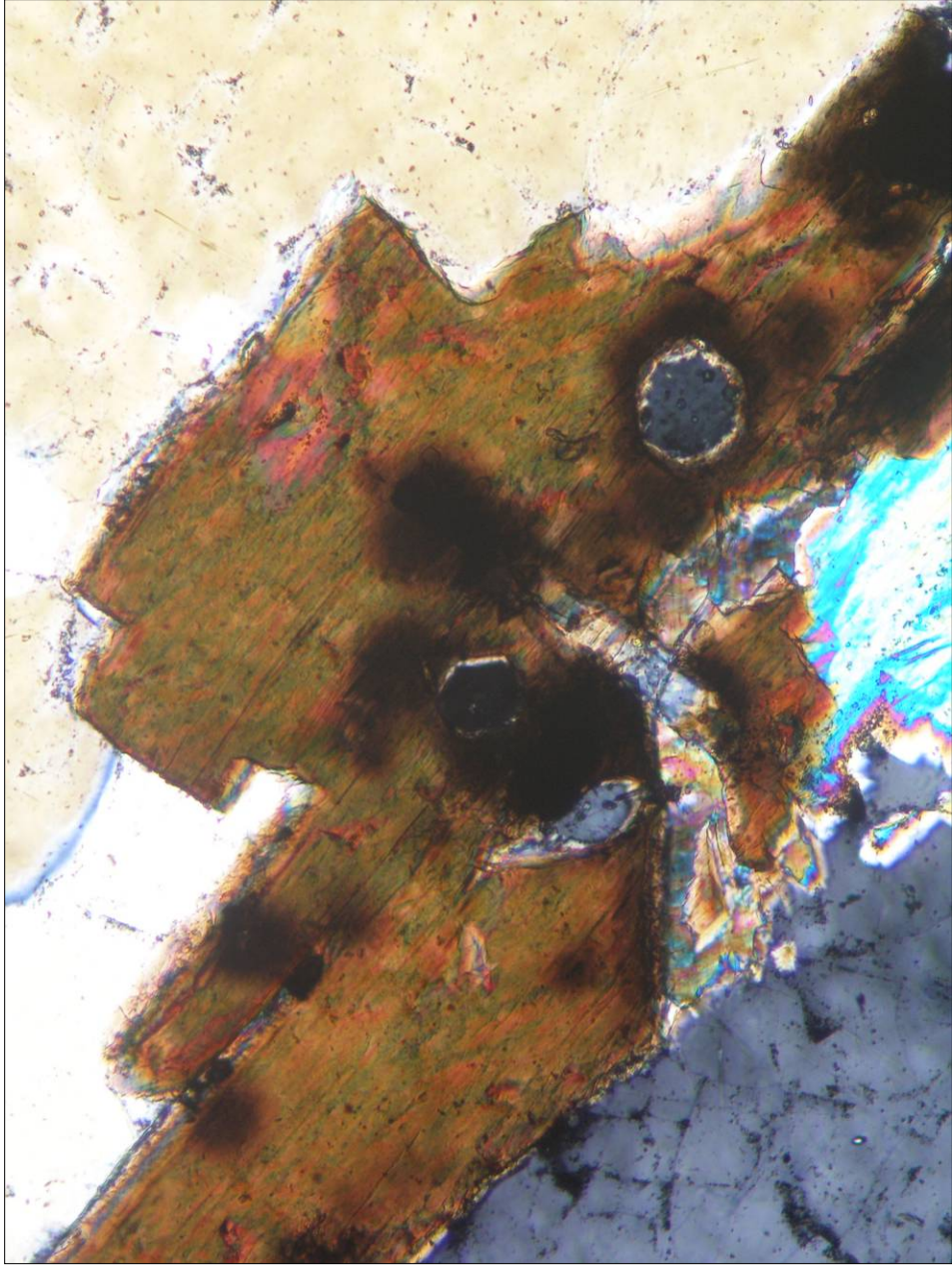


Strong pleochroism of biotite in mica schist from Kovářová, the Czech Republic; PPL. Width of fields of view is ca. 1.7 mm. Photo: JiZi.

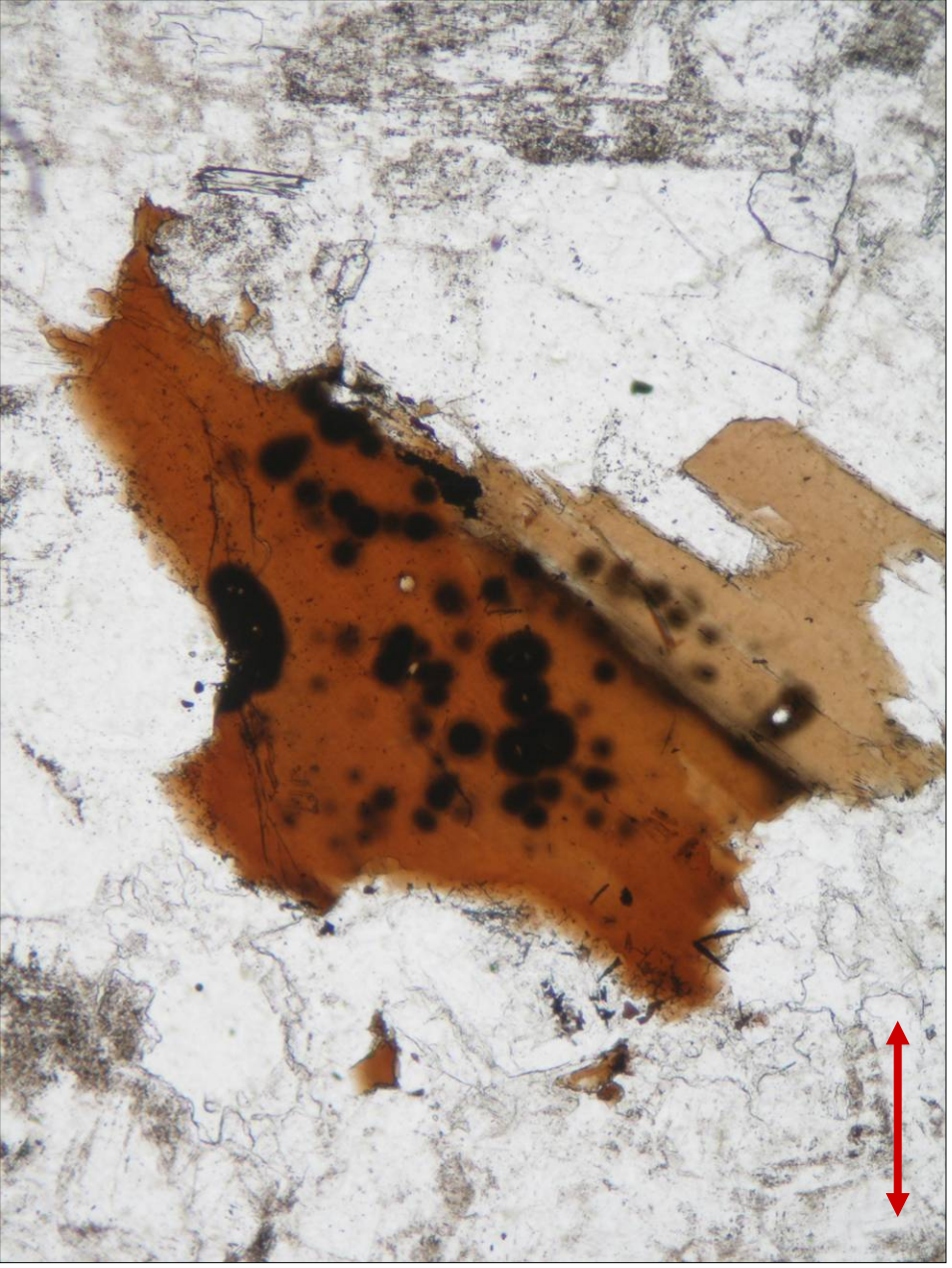


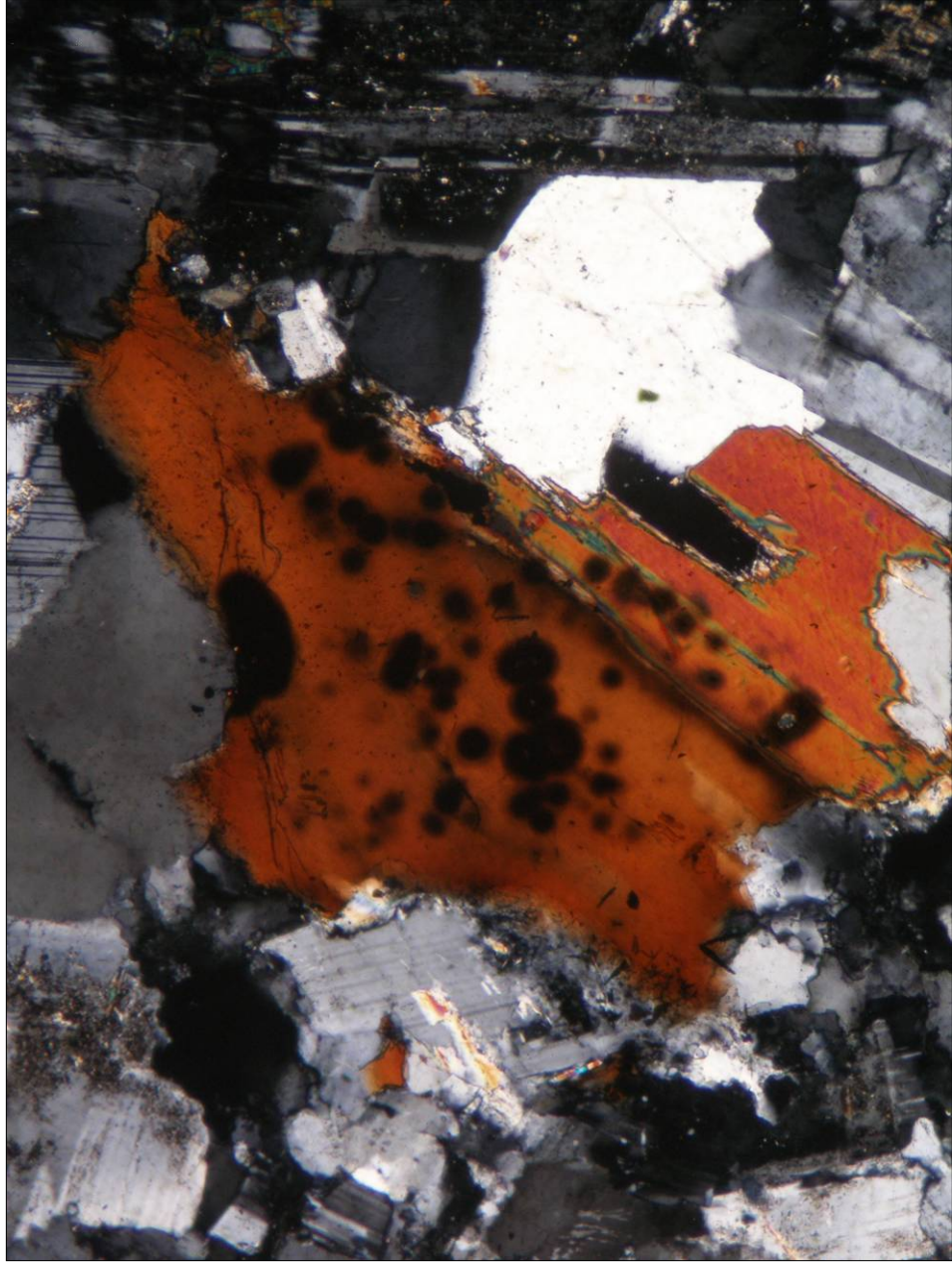
Biotite and sillimanite (fibrolite) in mica schist from Kovářová, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.7 mm. Photo: JiZi.



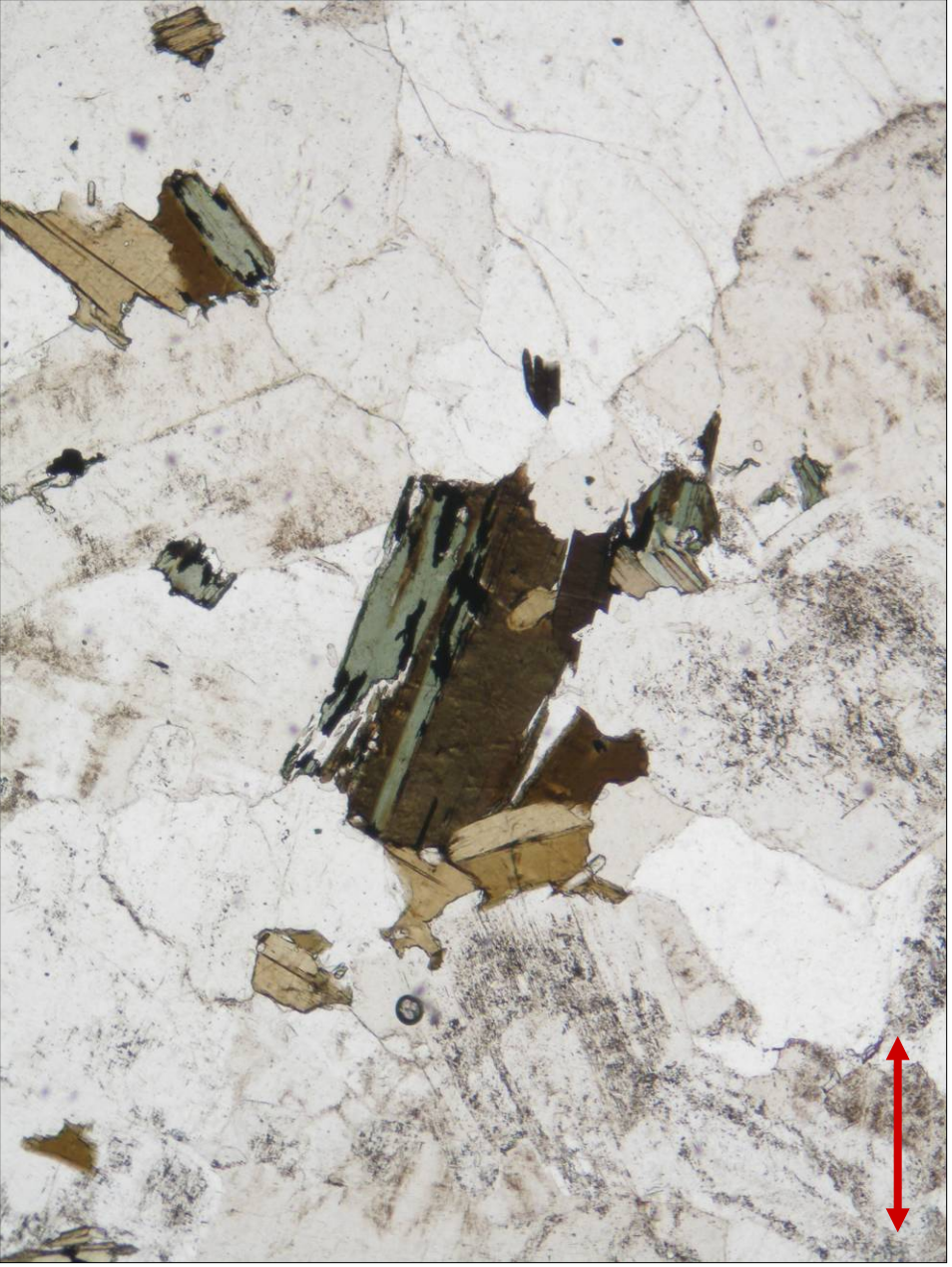


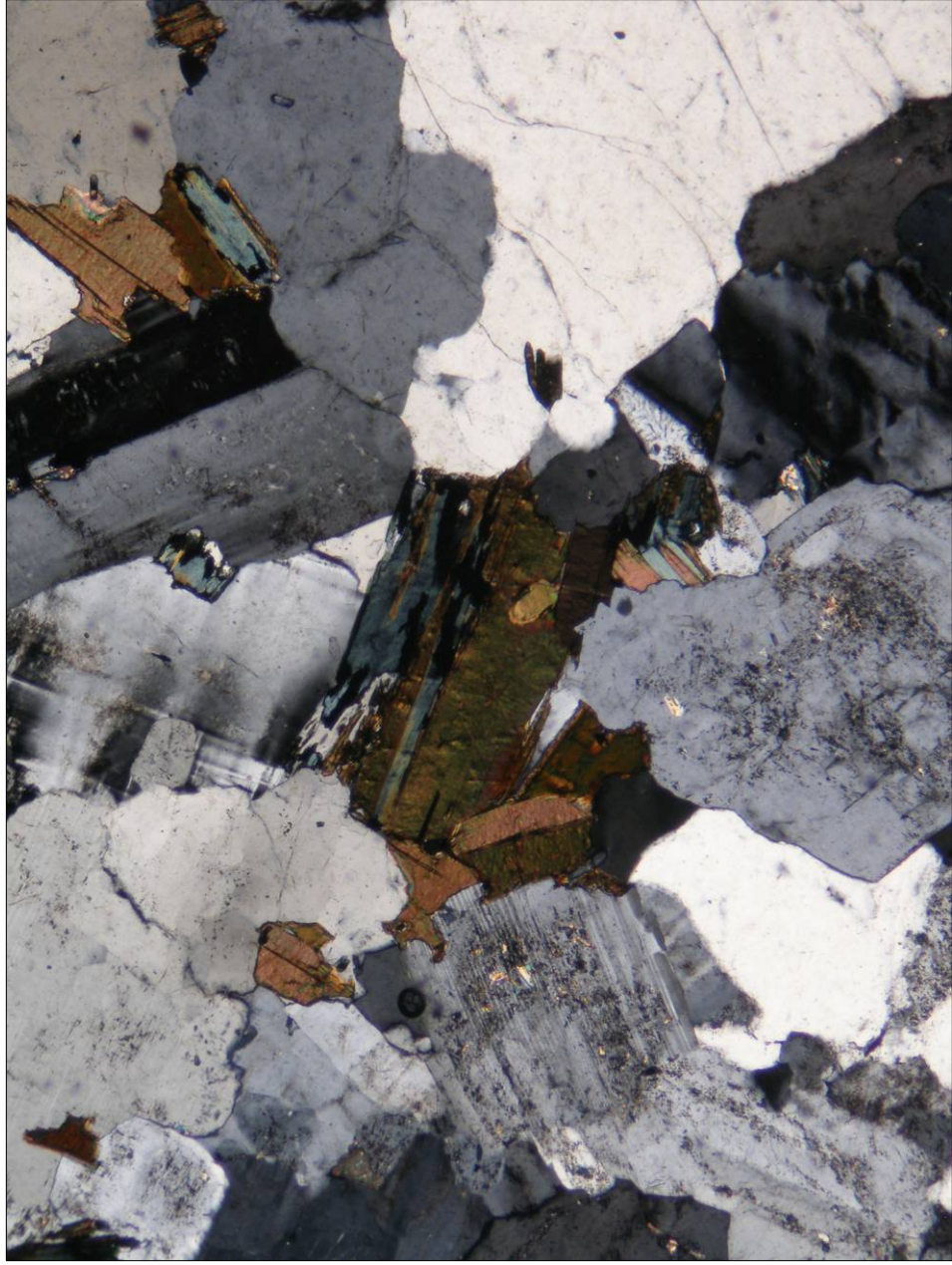
Biotite with apatite inclusions in granite from Mrákotín, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.7 mm. Photo: JiZi.



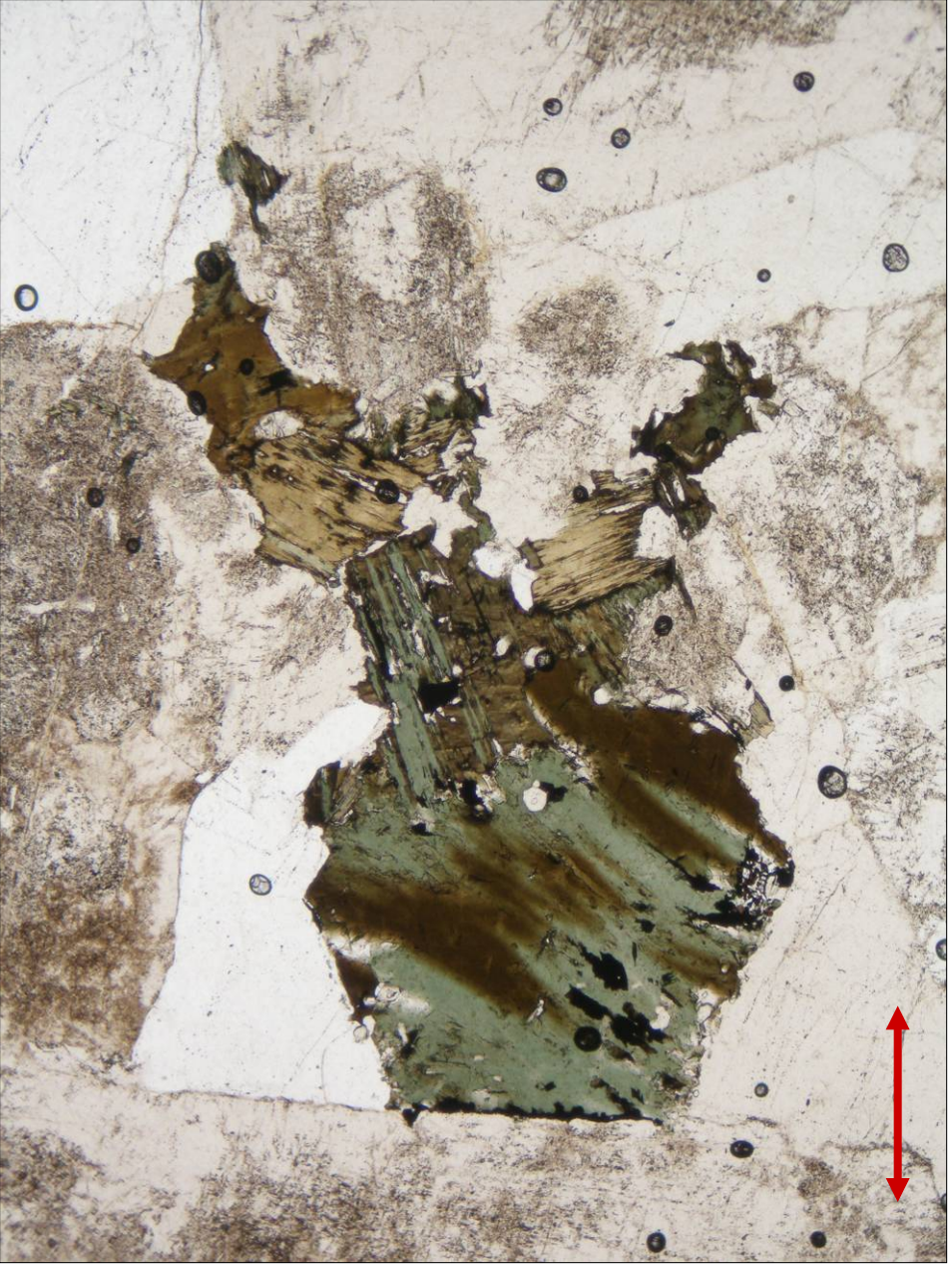


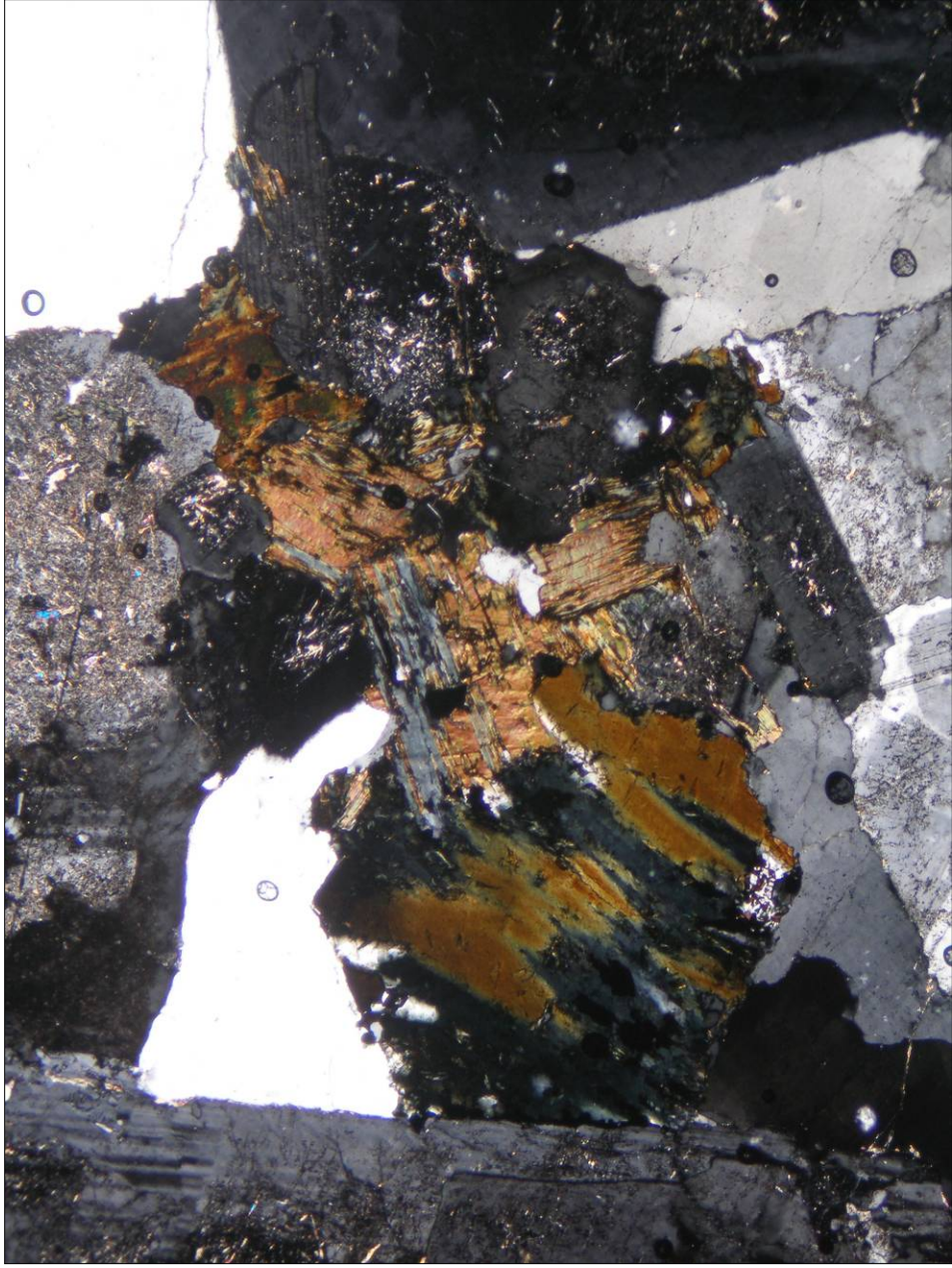
Biotite with dark pleochroic halos around radioactive inclusions in granite from Mrákotín, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.



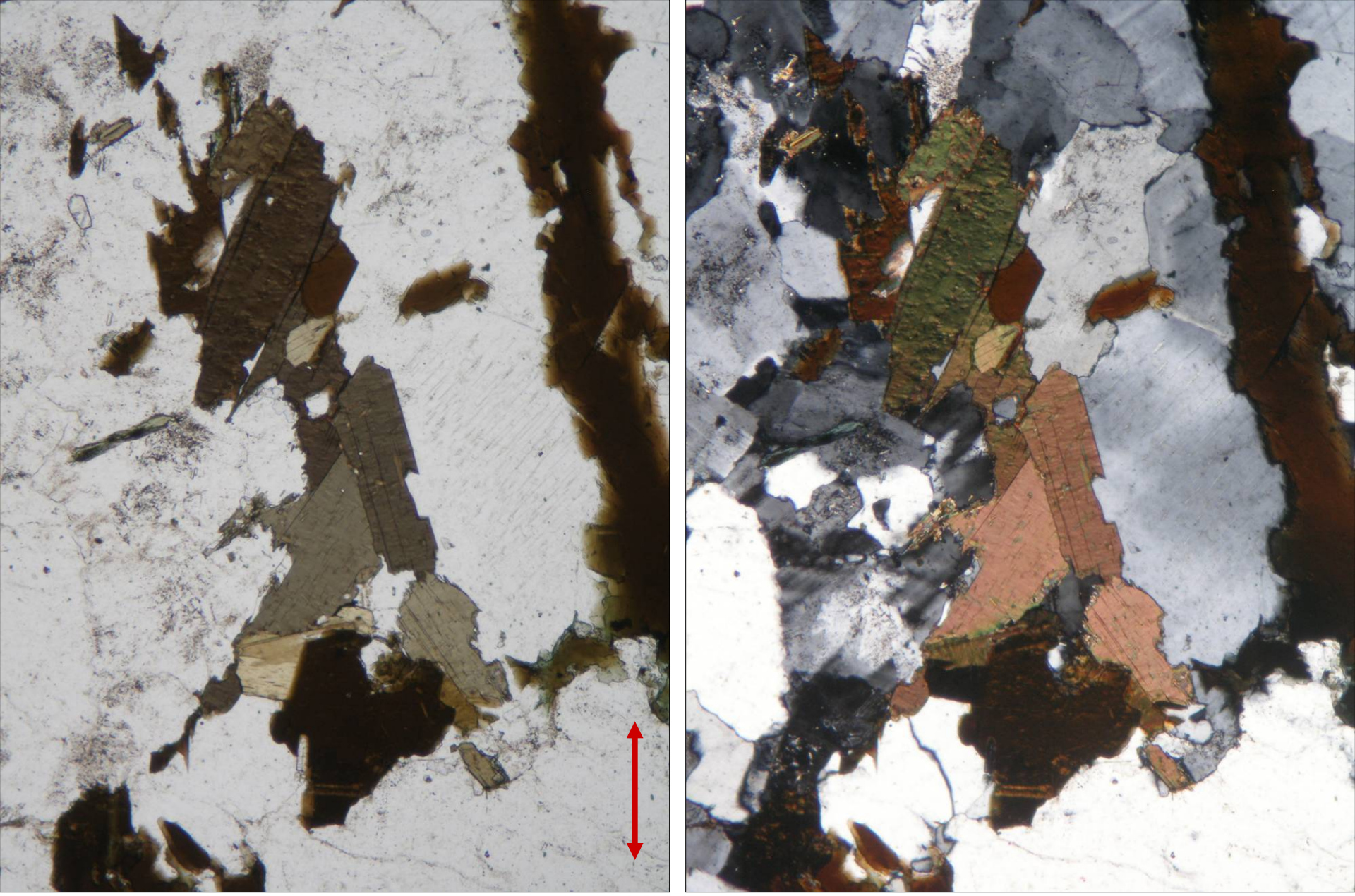


Partly chloritized biotite in granite from Černá Voda, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.5 mm. Photo: JiZi.

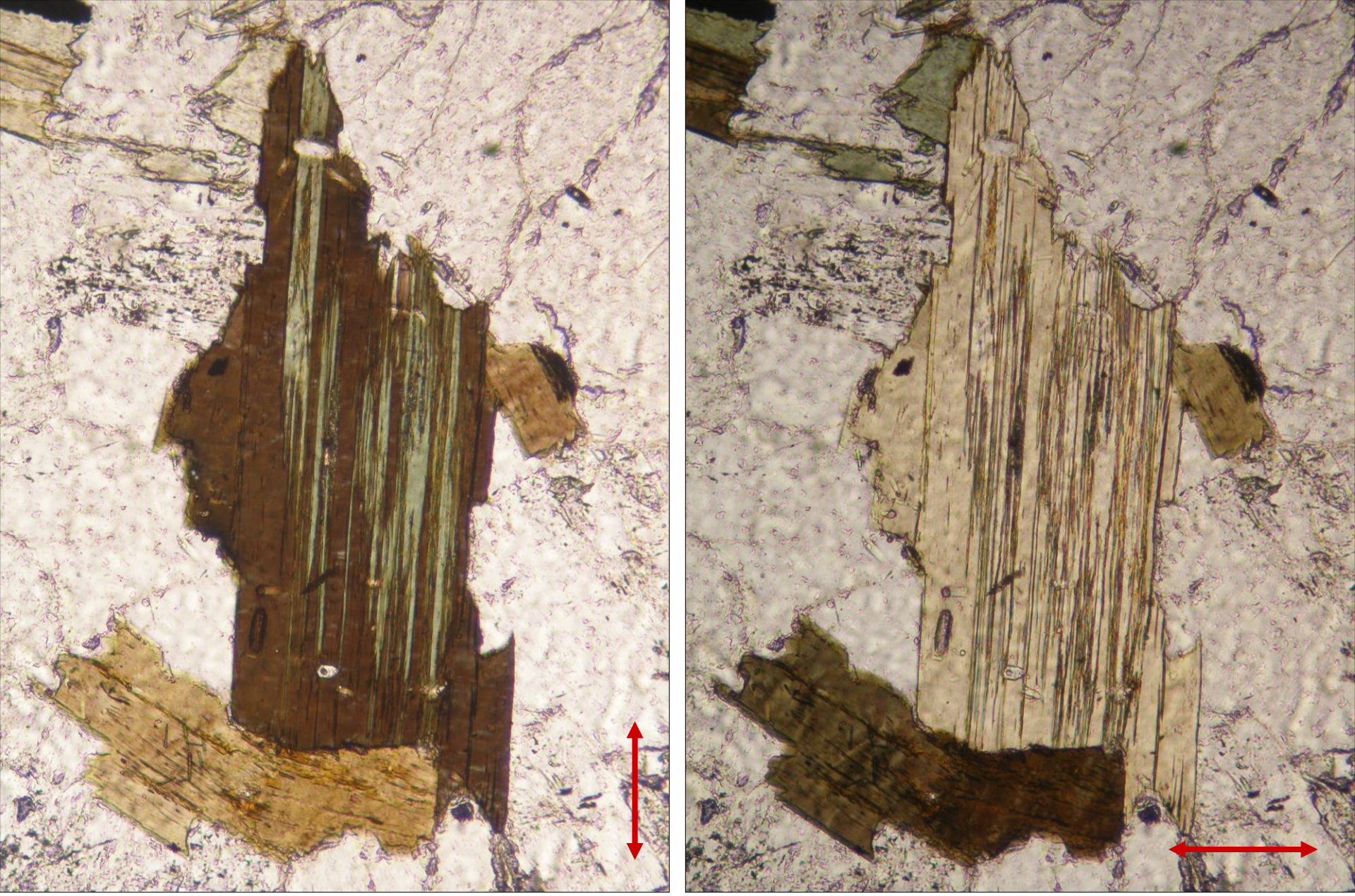




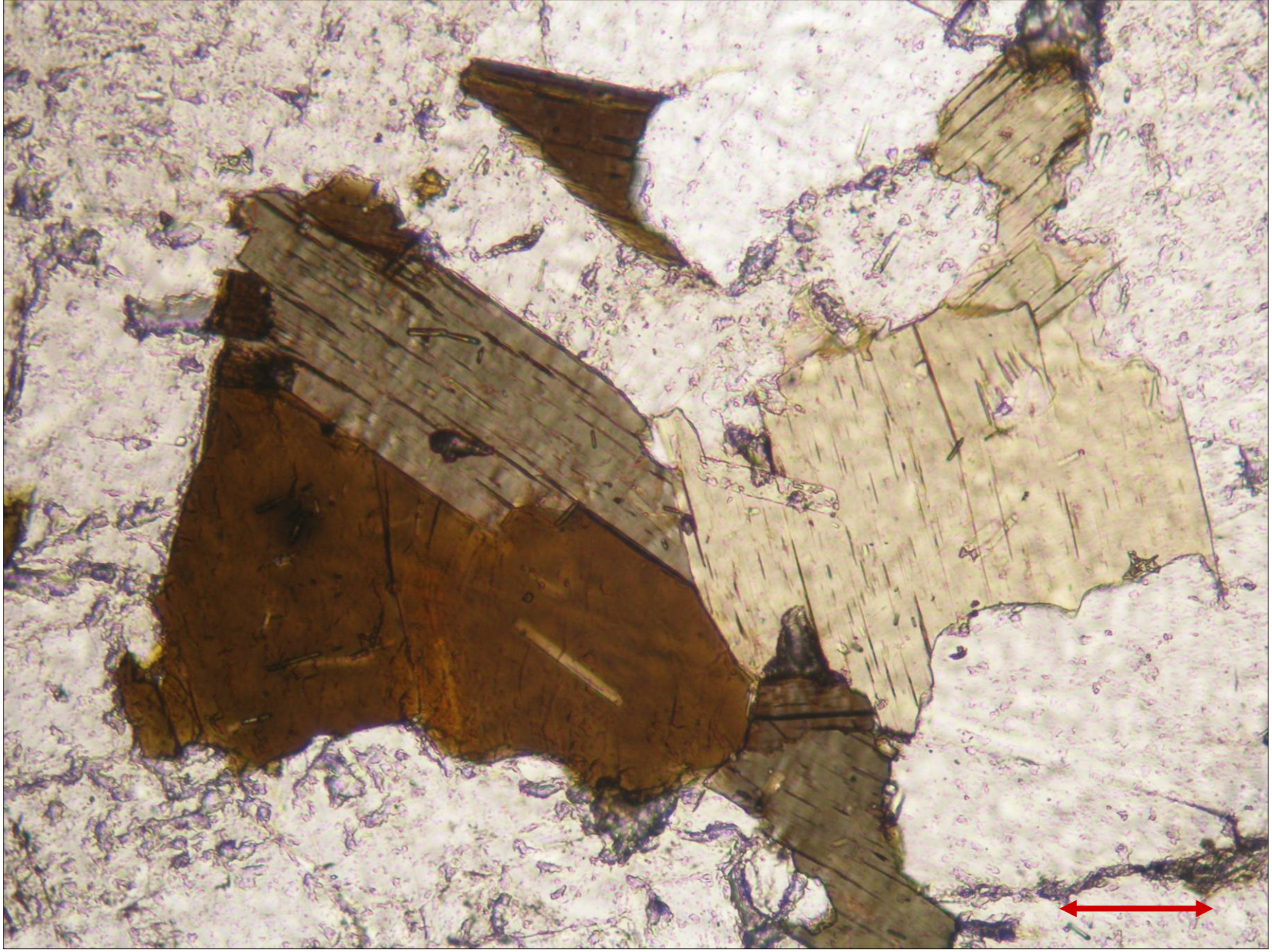
Partly chloritized biotite in granite from Liberec, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.5 mm. Photo: JiZi.



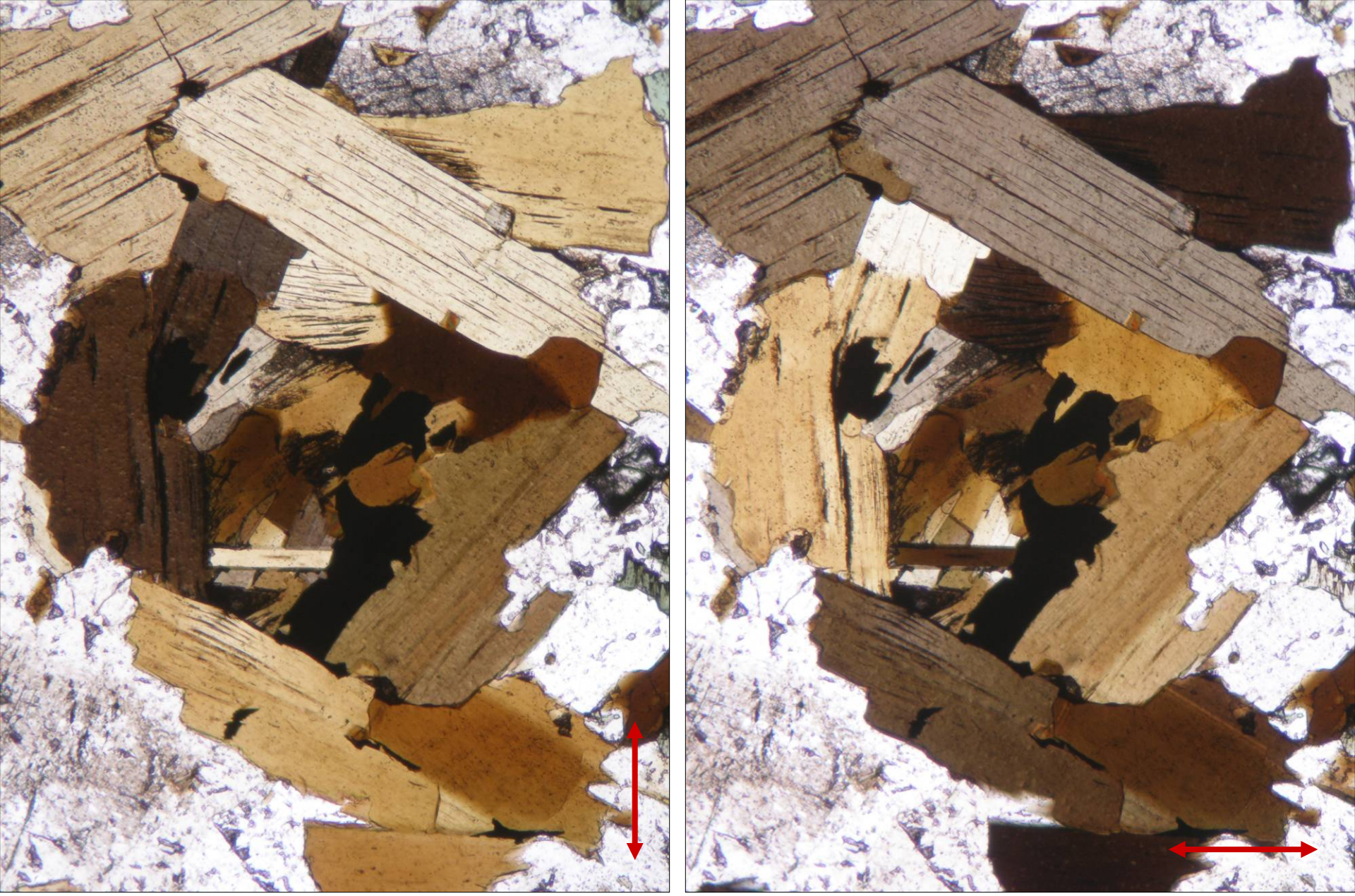
Biotite in granite from Černá Voda, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.7 mm. Photo: JiZi.



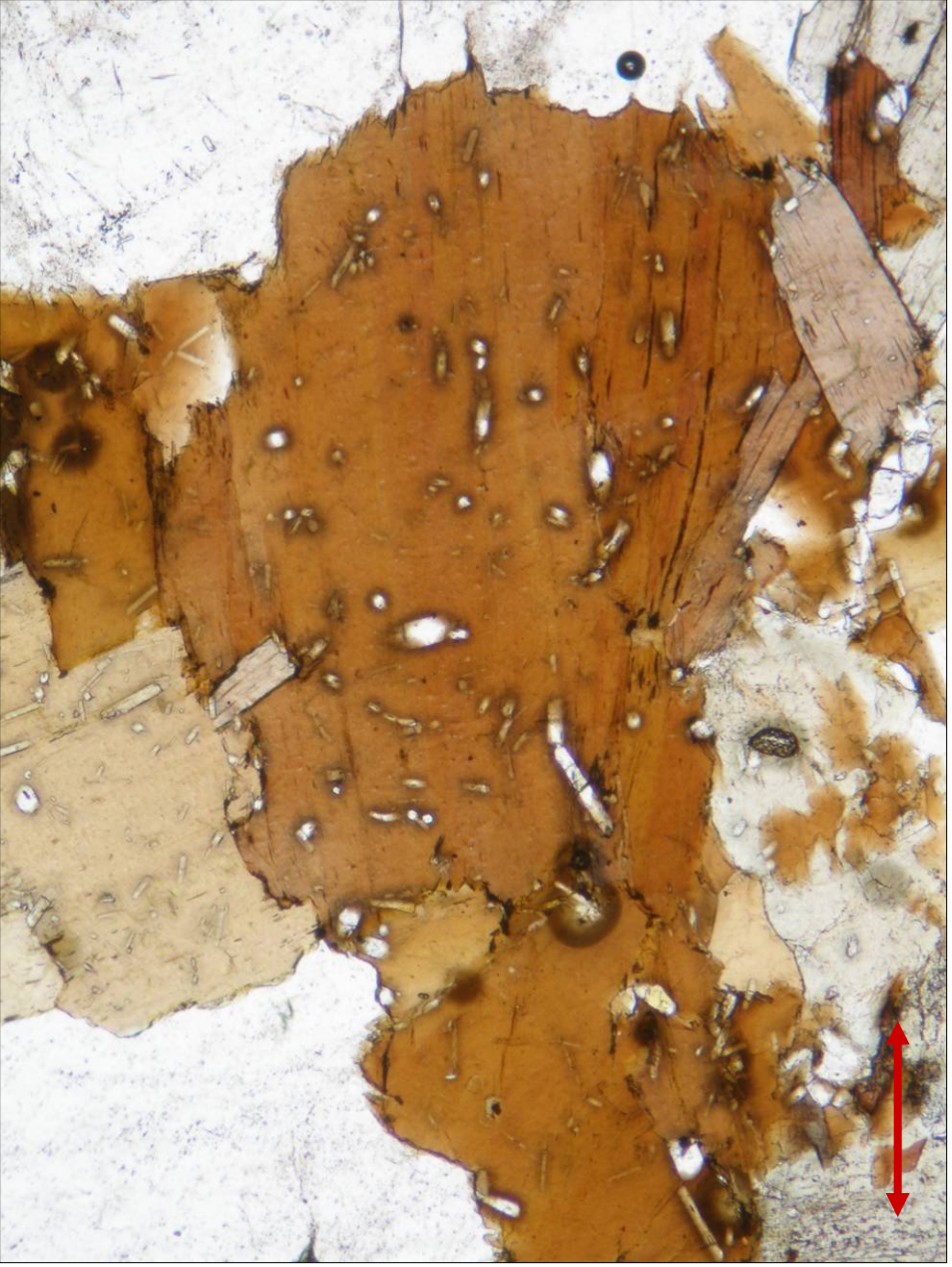
Pleochroism of biotite (partly chloritized) in granite from Žulová, the Czech Republic; PPL. Width of fields of view is ca. 1.7 mm. Photo: JiZi.

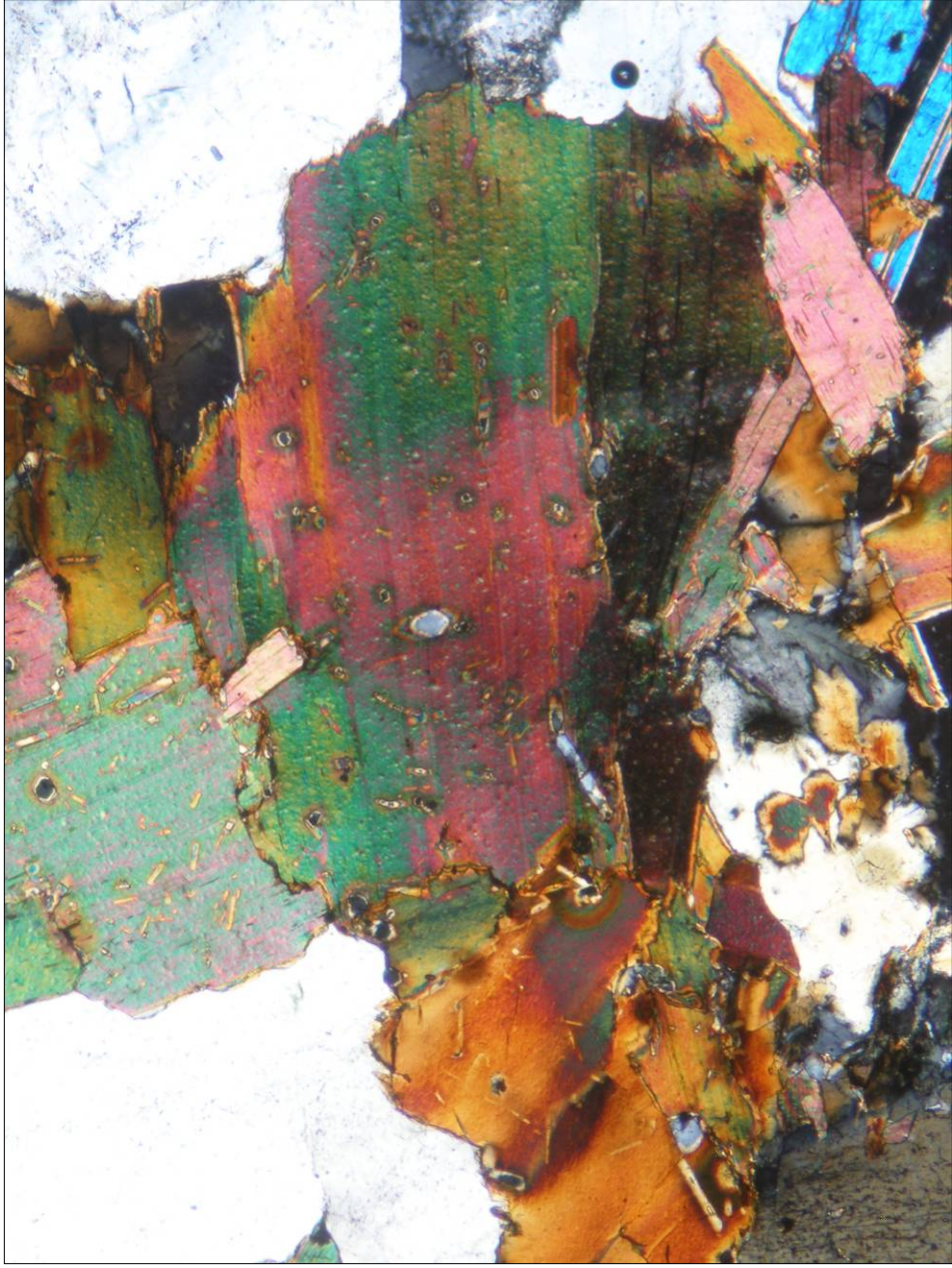


Pleochroism of biotite in granite from Žulová, the Czech Republic; PPL. Width of the field of view is ca. 2.0 mm. Photo: JiZi.

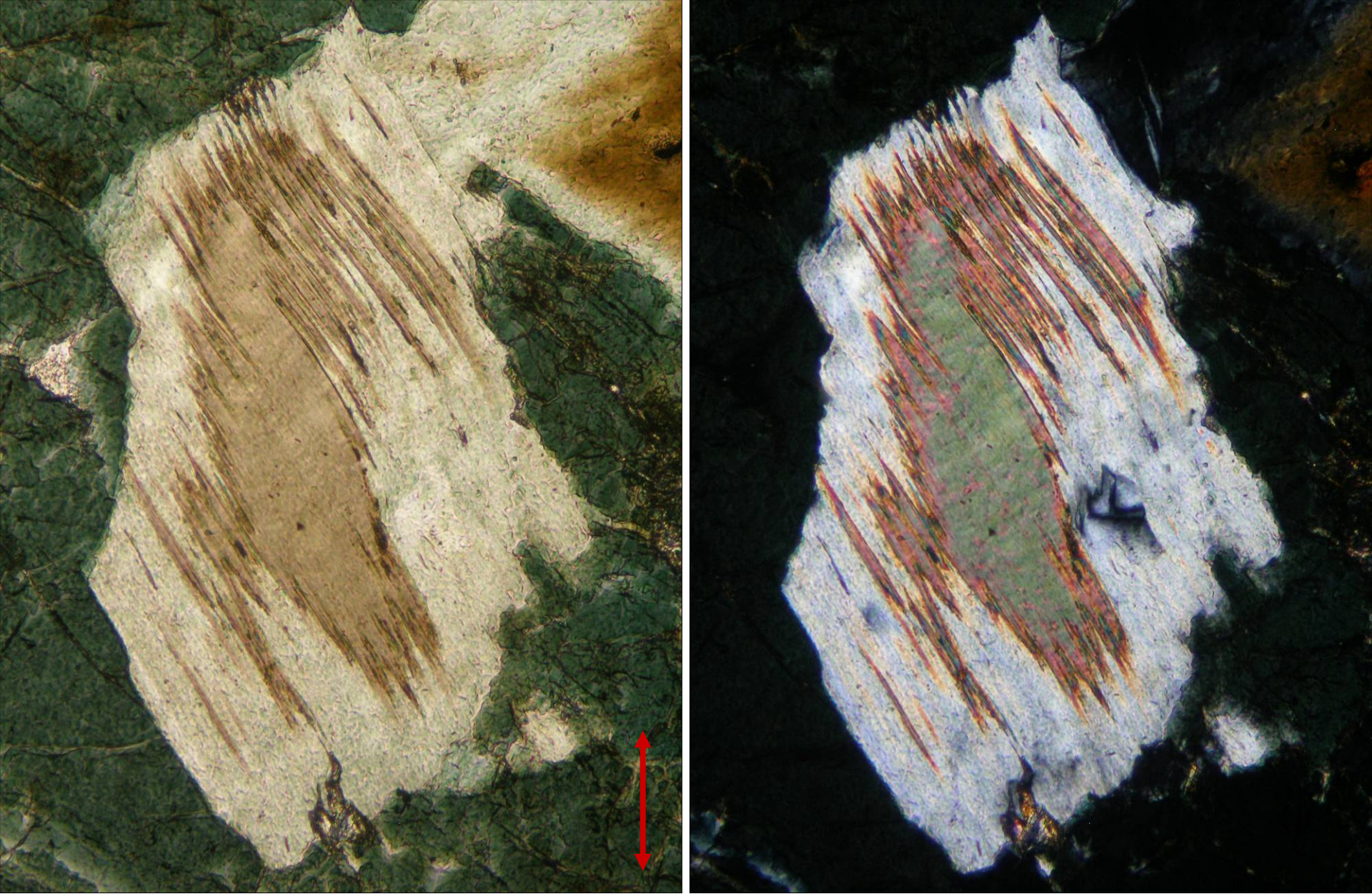


Pleochroism of biotite in diorite from Dolní Skorošice, the Czech Republic; PPL. Width of fields of view is ca. 1.7 mm. Photo: JiZi.

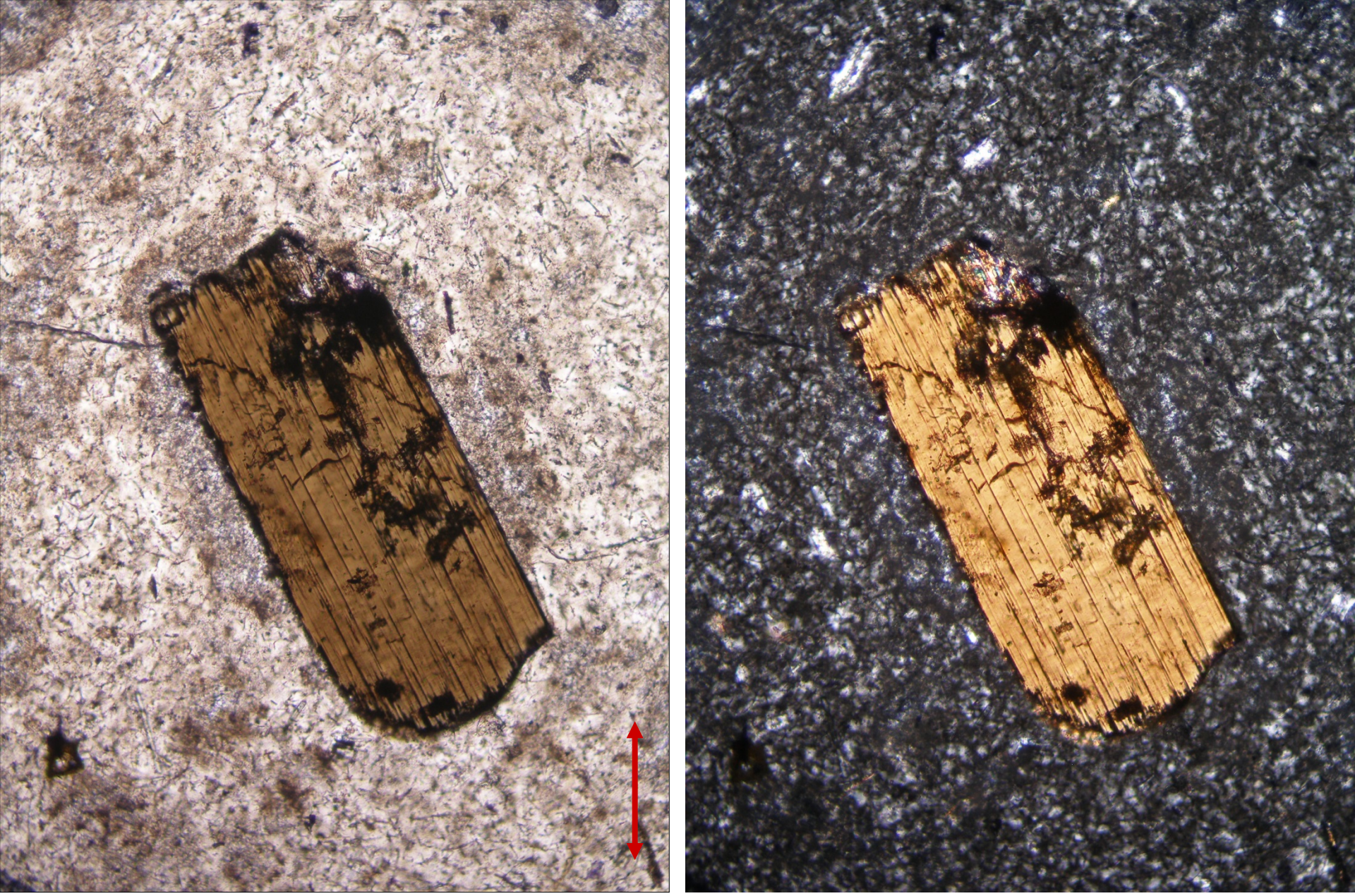




Biotite with apatite inclusions in syenite from Tasov, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.7 mm. Photo: JiZi.

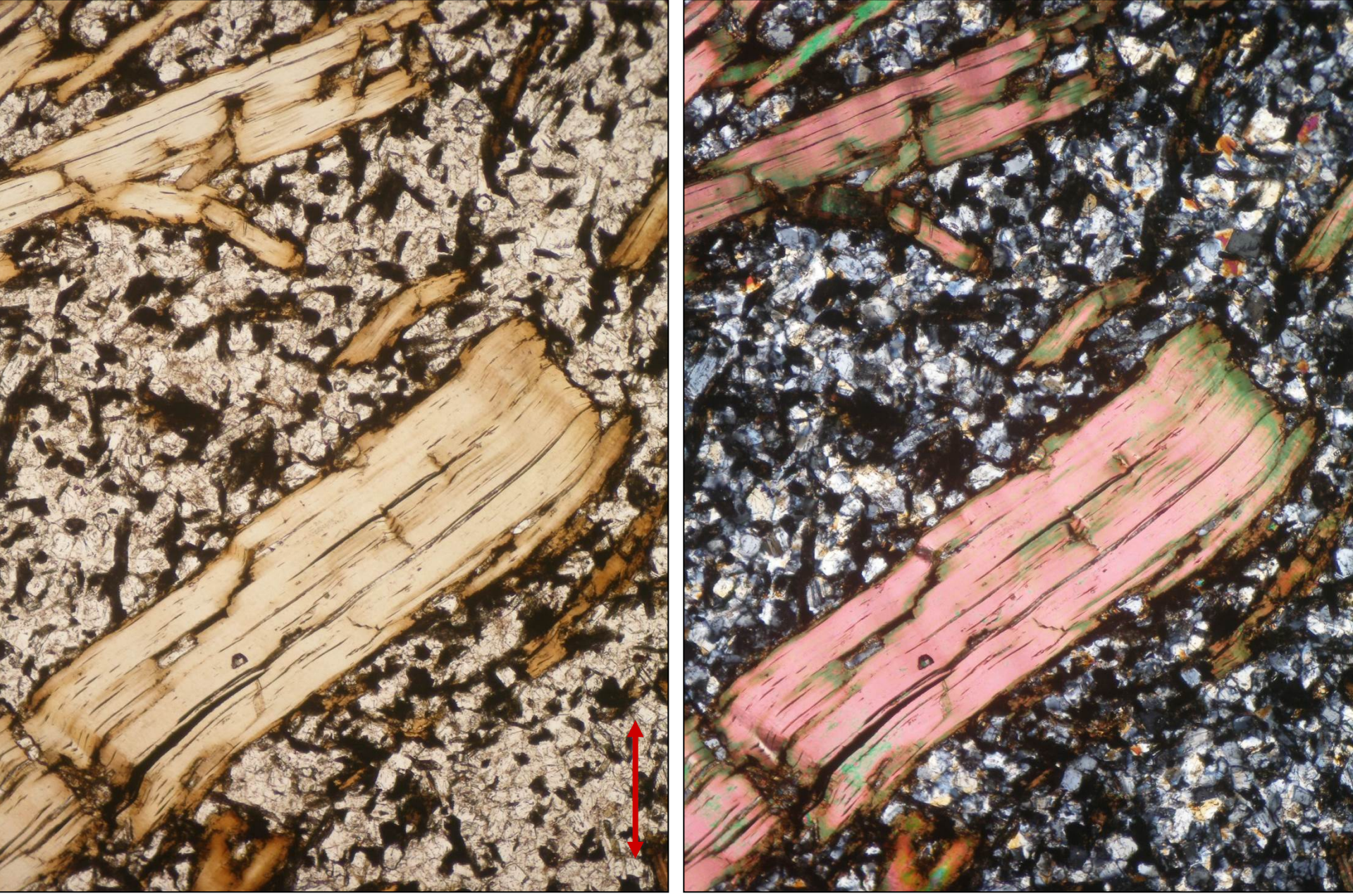


Partly chloritized biotite in pegmatite from Vlastějovice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.5 mm. Photo: JiZi.

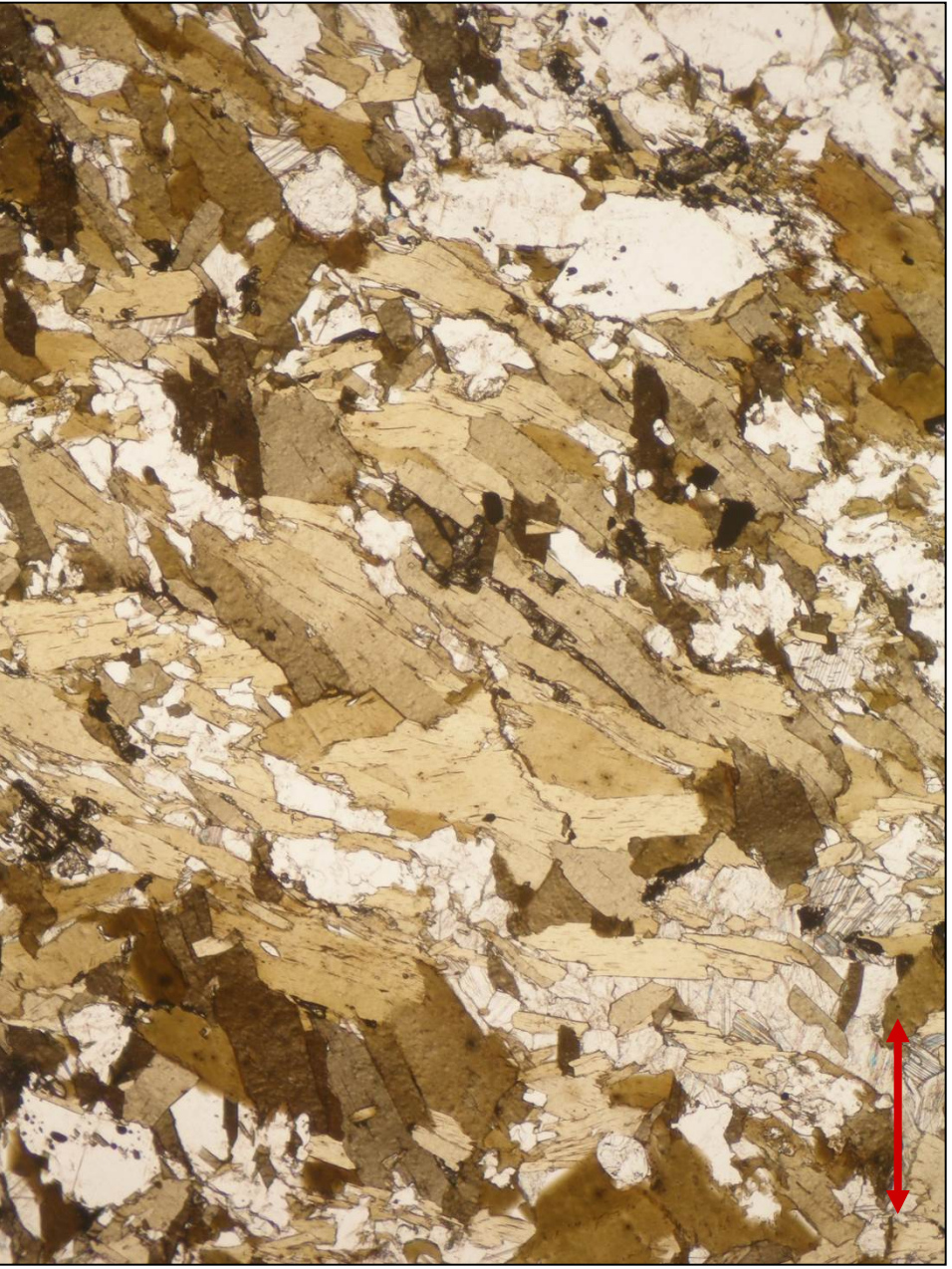


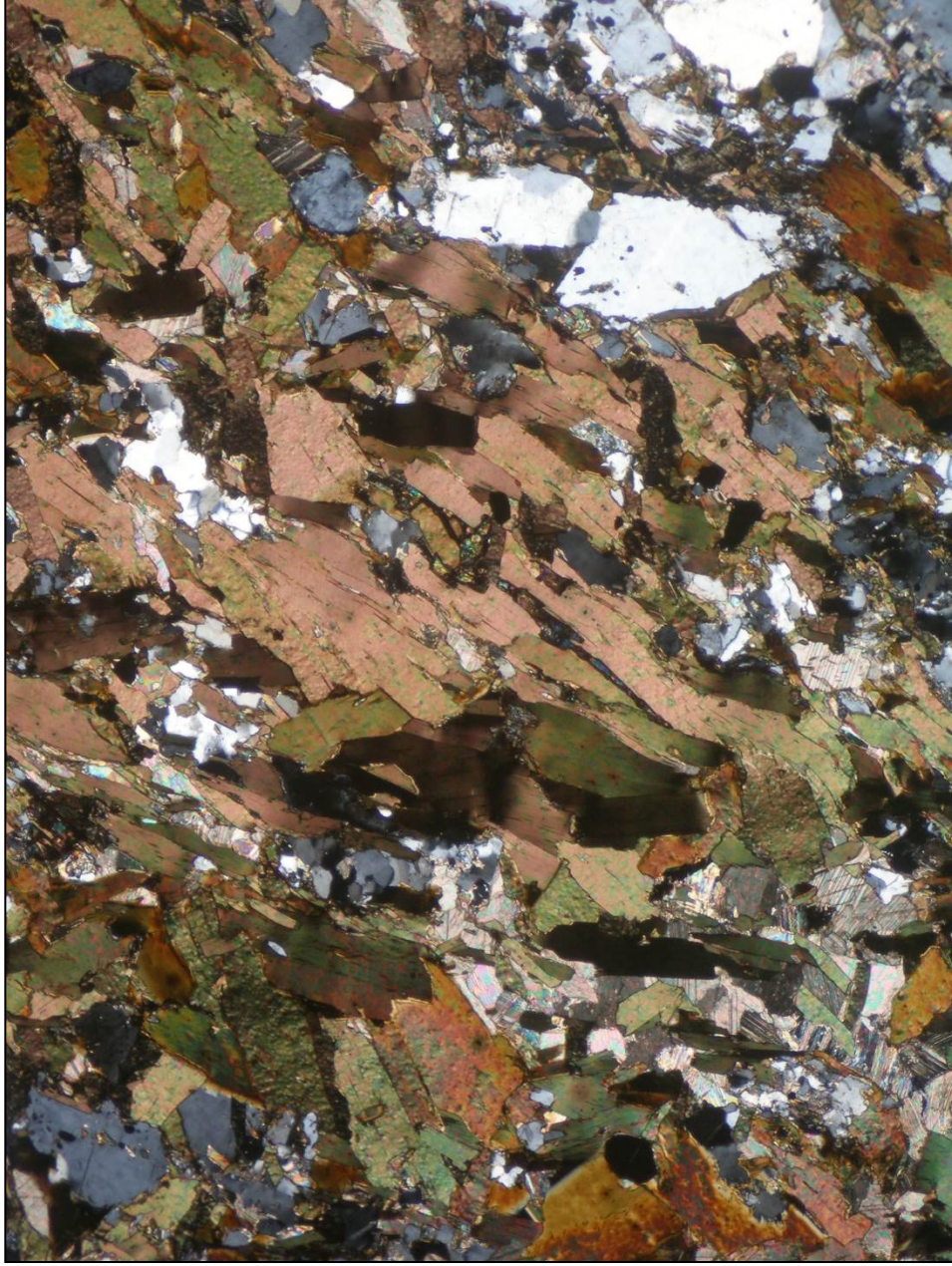
Biotite in rhyolite from Žiar nad Hronom, Slovakia; PPL (left) and XPL (right). Width of fields of view is ca. 0.7 mm. Photo: JiZi.

Biotite in lamprophyre from Malá Zdobnice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2.4 mm. Photo: JiZi.

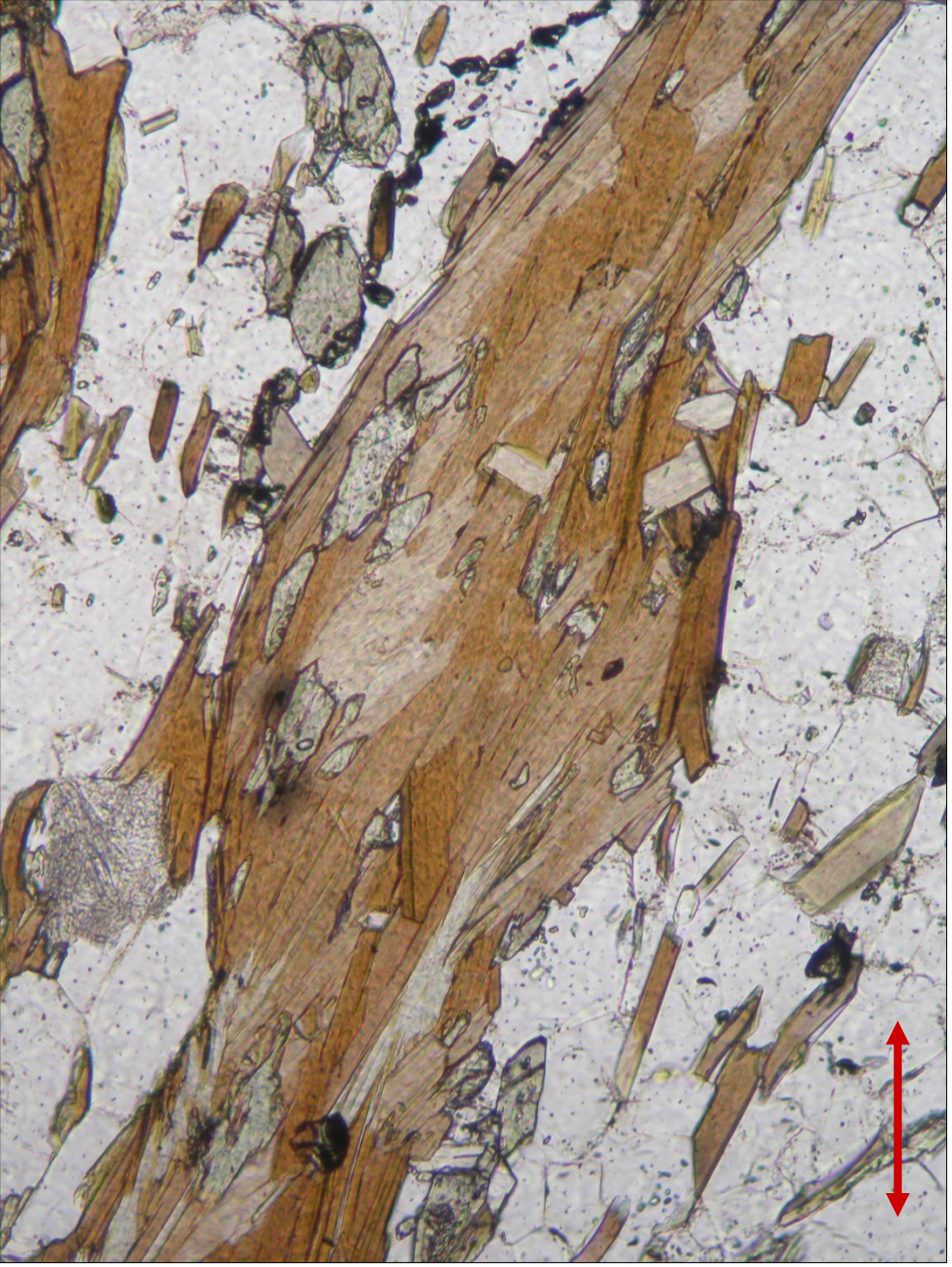


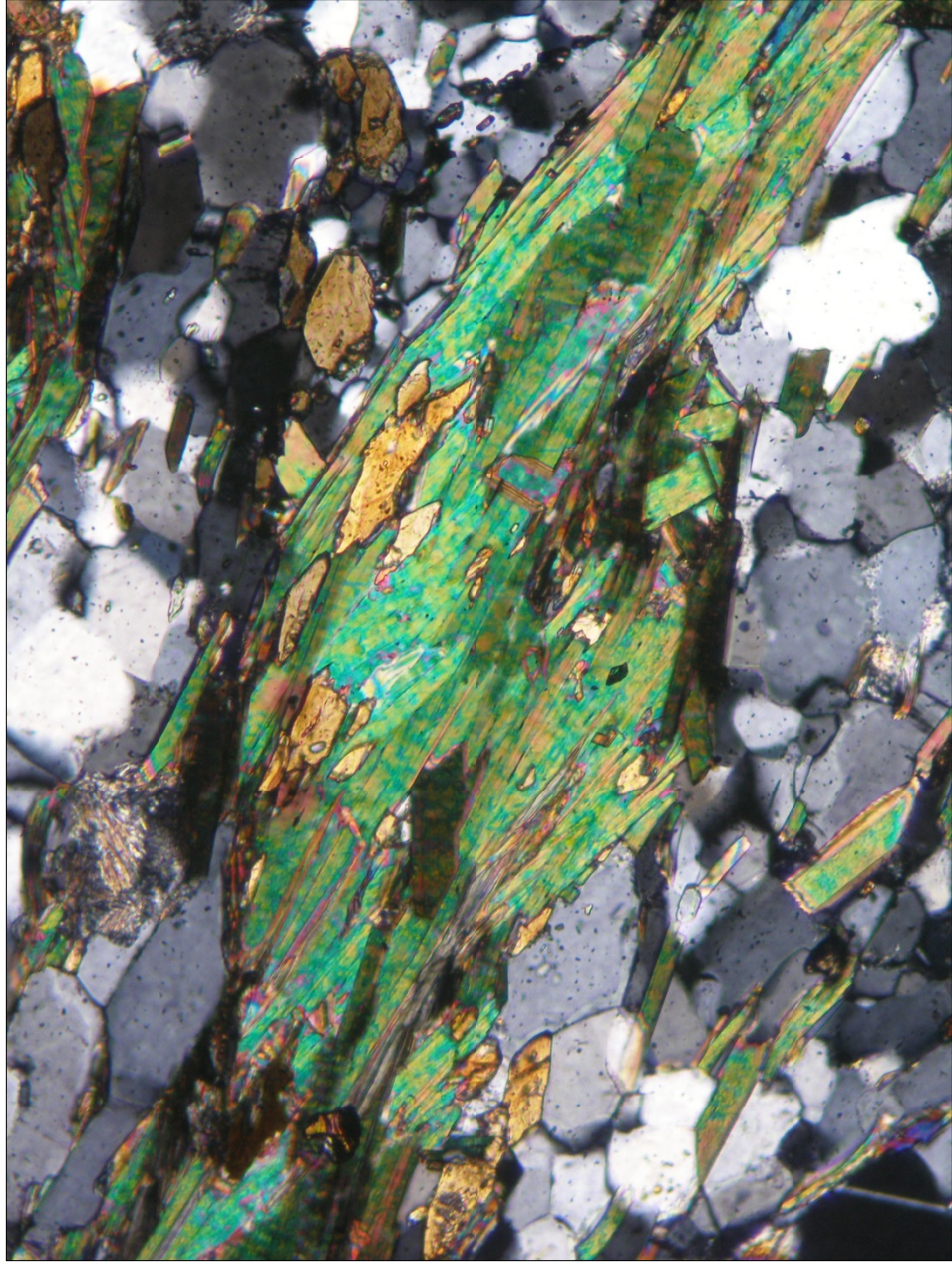
Biotite in lamprophyre from Malá Zdobnice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.0 mm. Photo: JiZi.



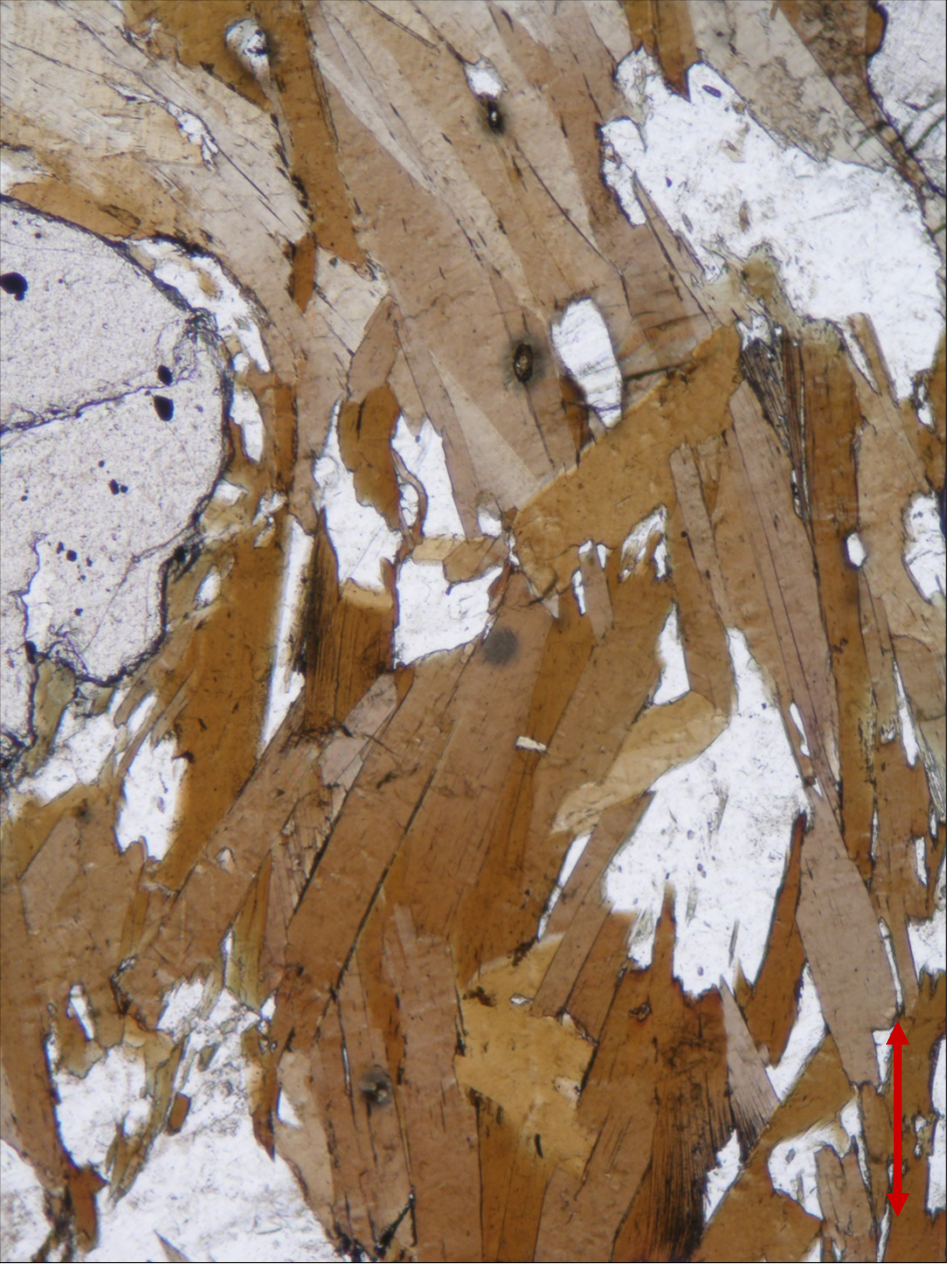


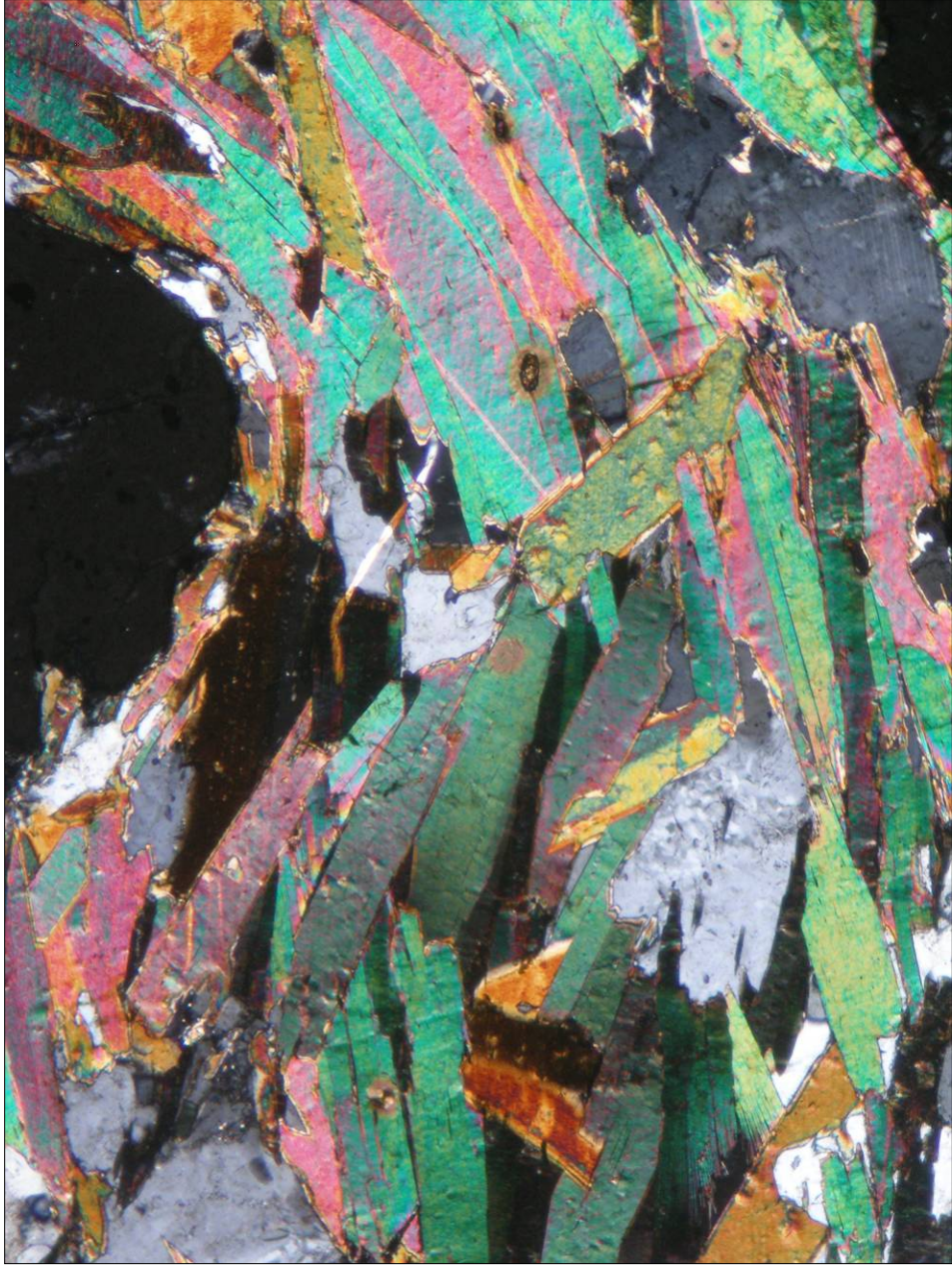
Biotite in gneiss from Velká Morava, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2.4 mm. Photo: JiZi.



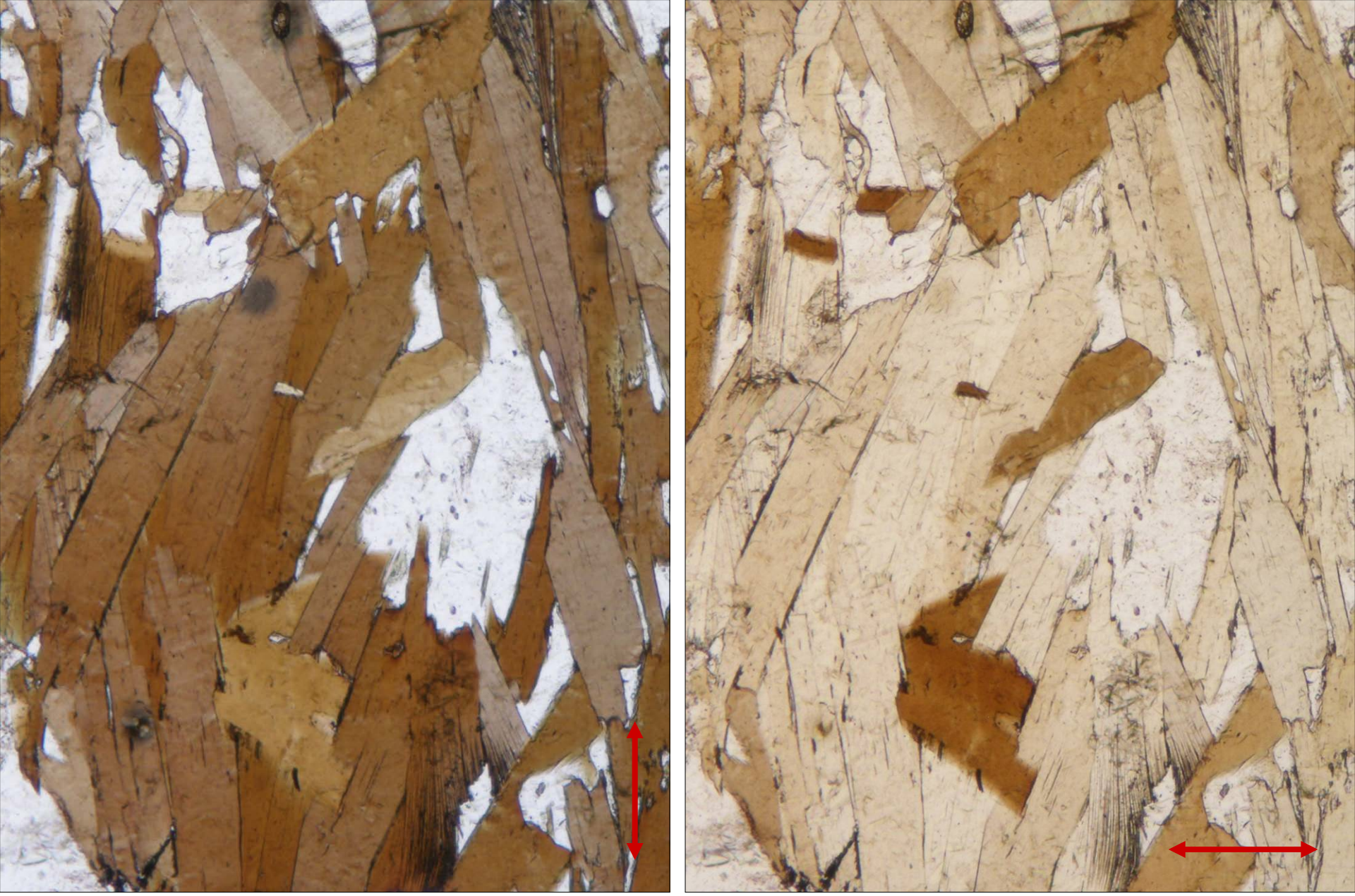


Biotite in mica schist from Lukov, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.7 mm. Photo: JiZi.

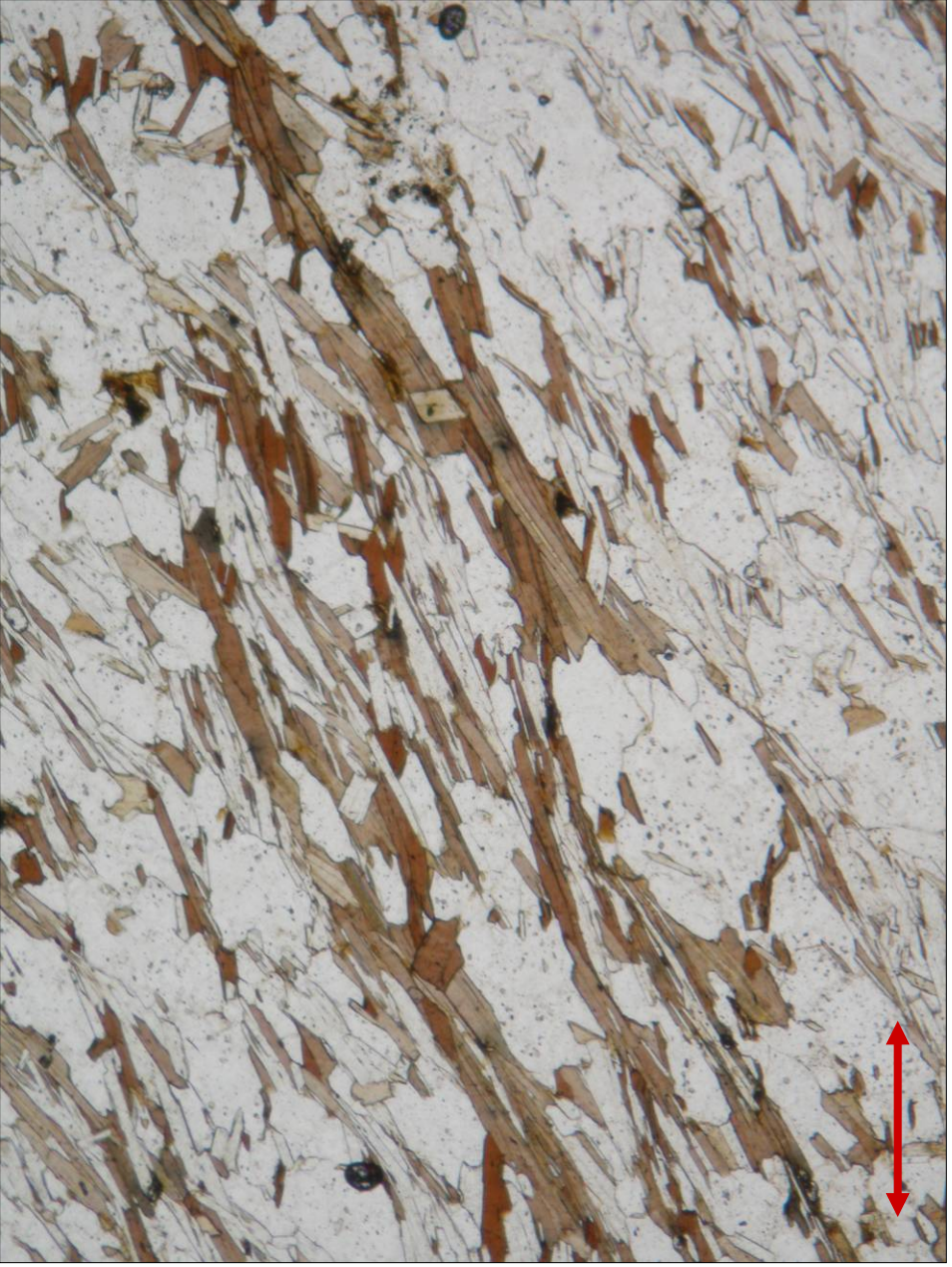


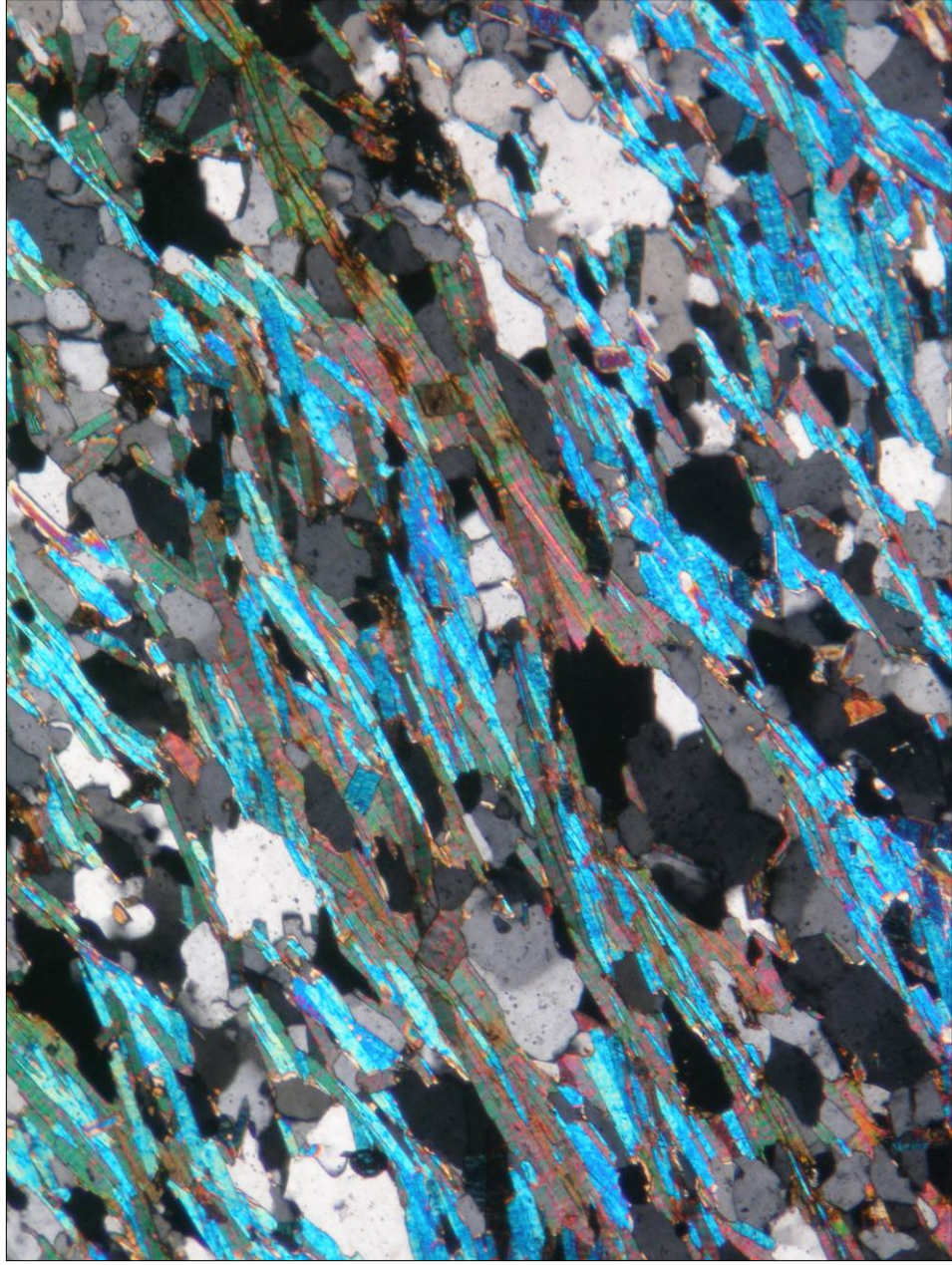


Biotite (with zircon inclusions) and garnet in paragneiss from Dolní Rožínka, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.

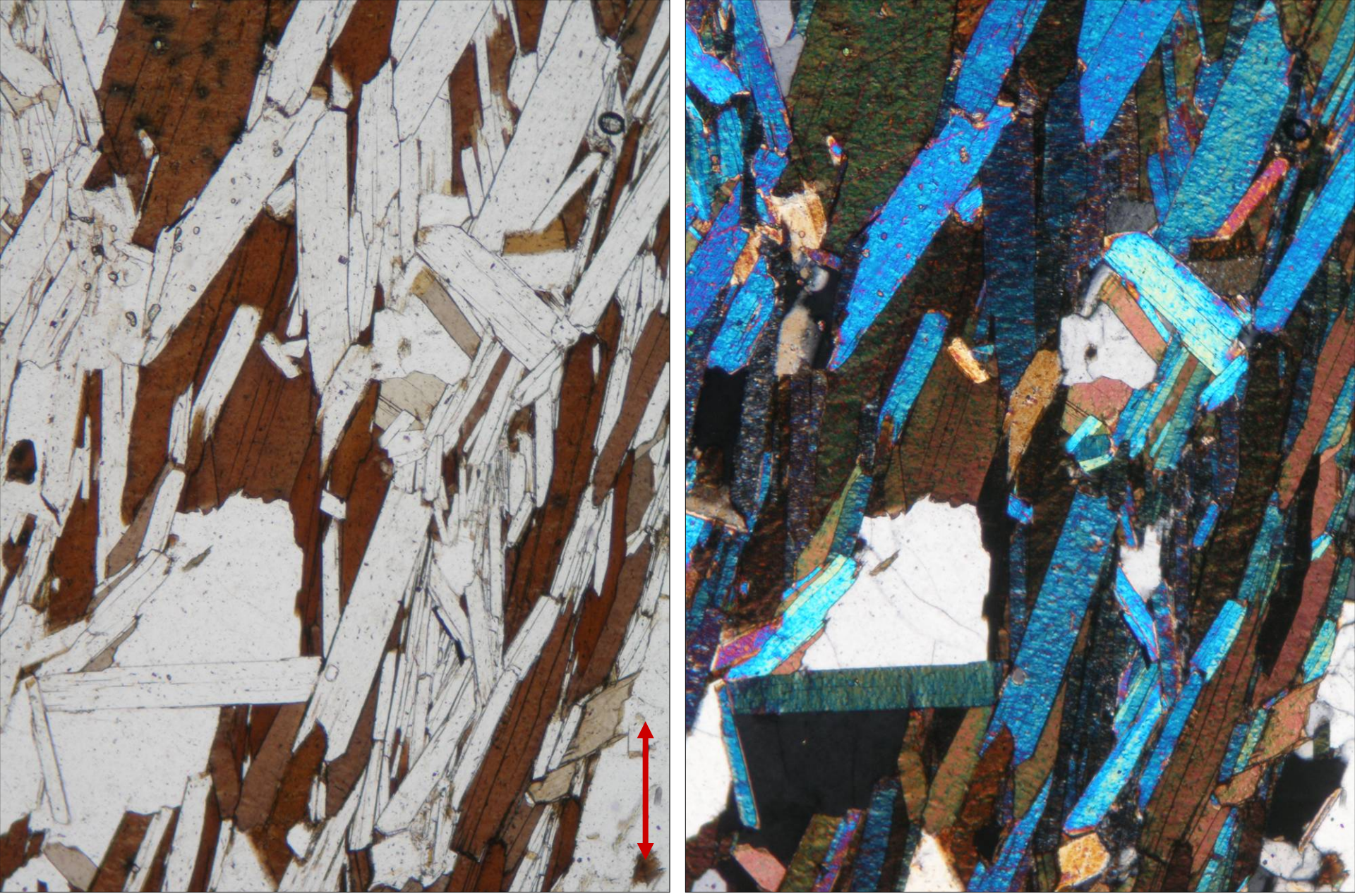


Strong pleochroism of biotite in paragneiss from Dolní Rožínka, the Czech Republic; PPL. Width of fields of view is ca. 1.2 mm. Photo: JiZi.

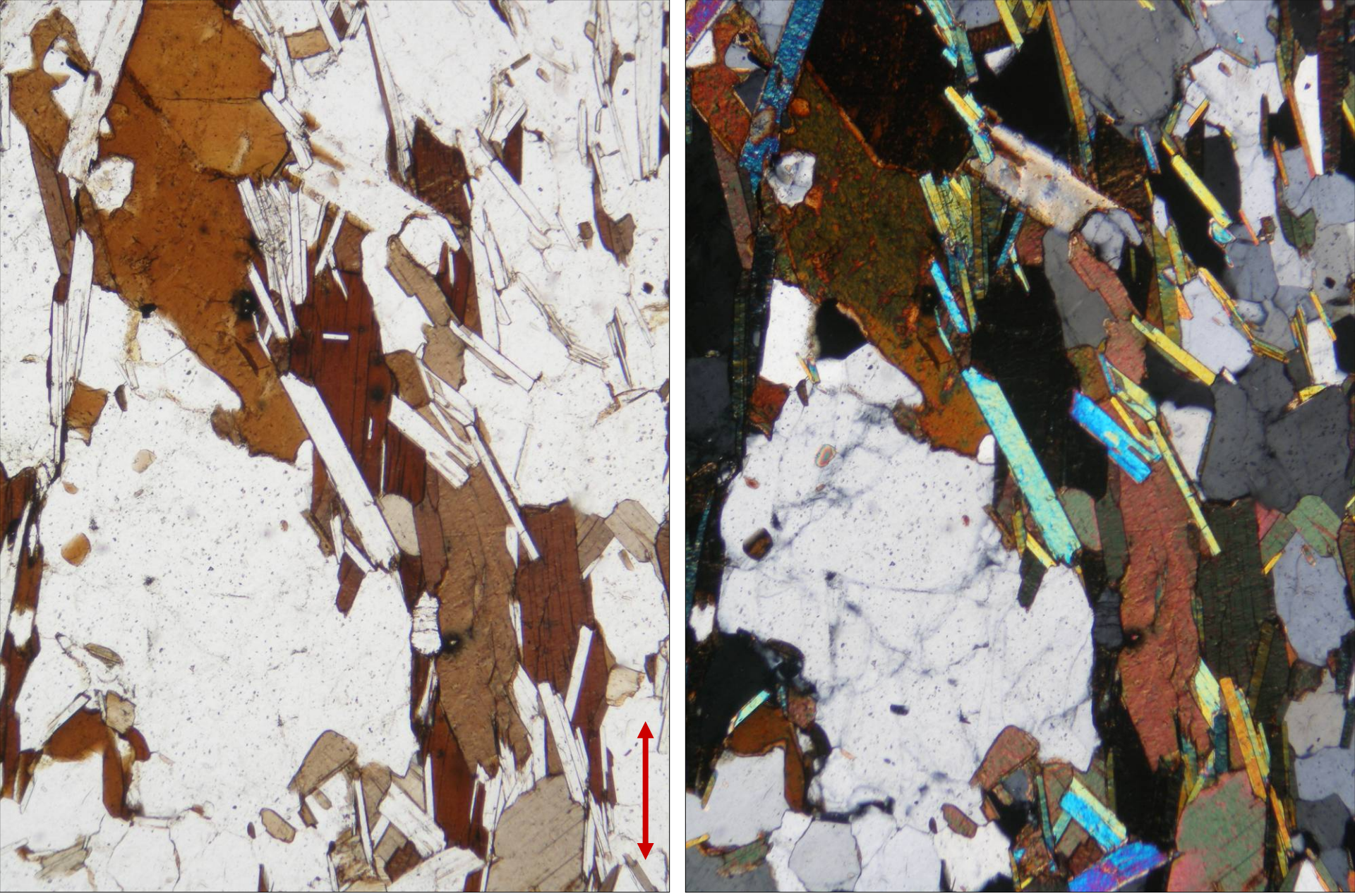




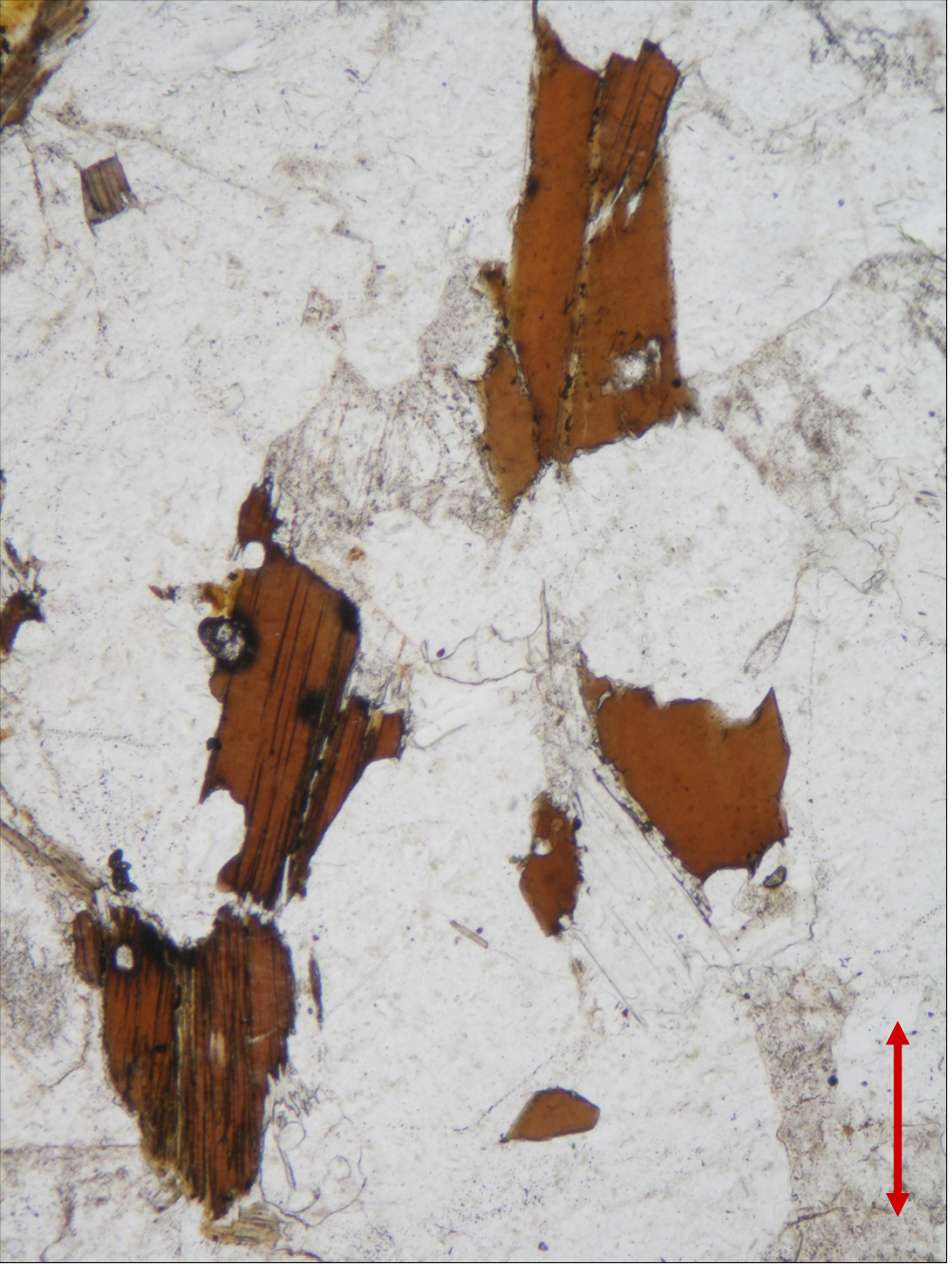
Biotite and muscovite in mica schist from Lukov, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.

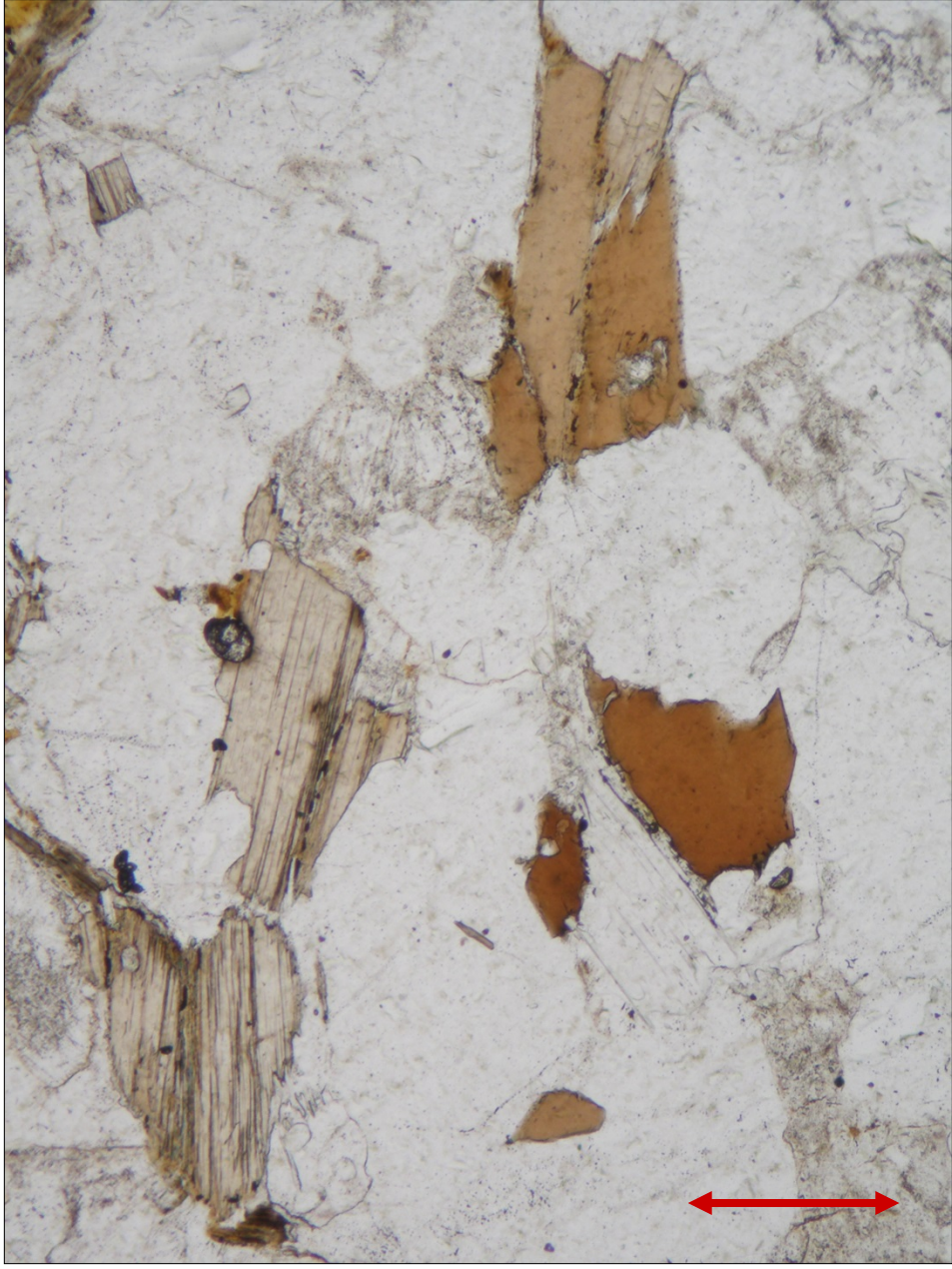


Biotite and muscovite in mica schist from Česká Ves, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.

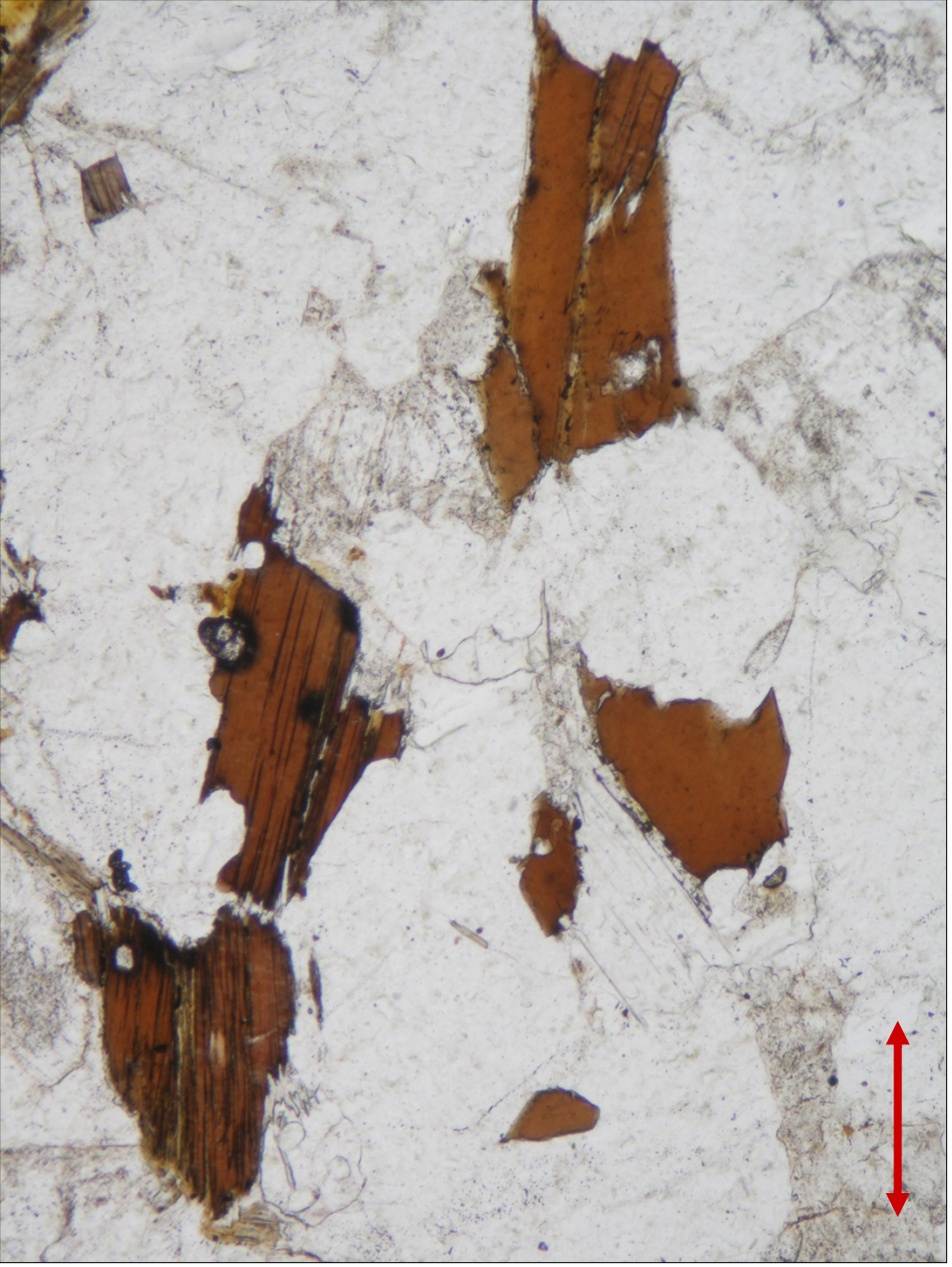


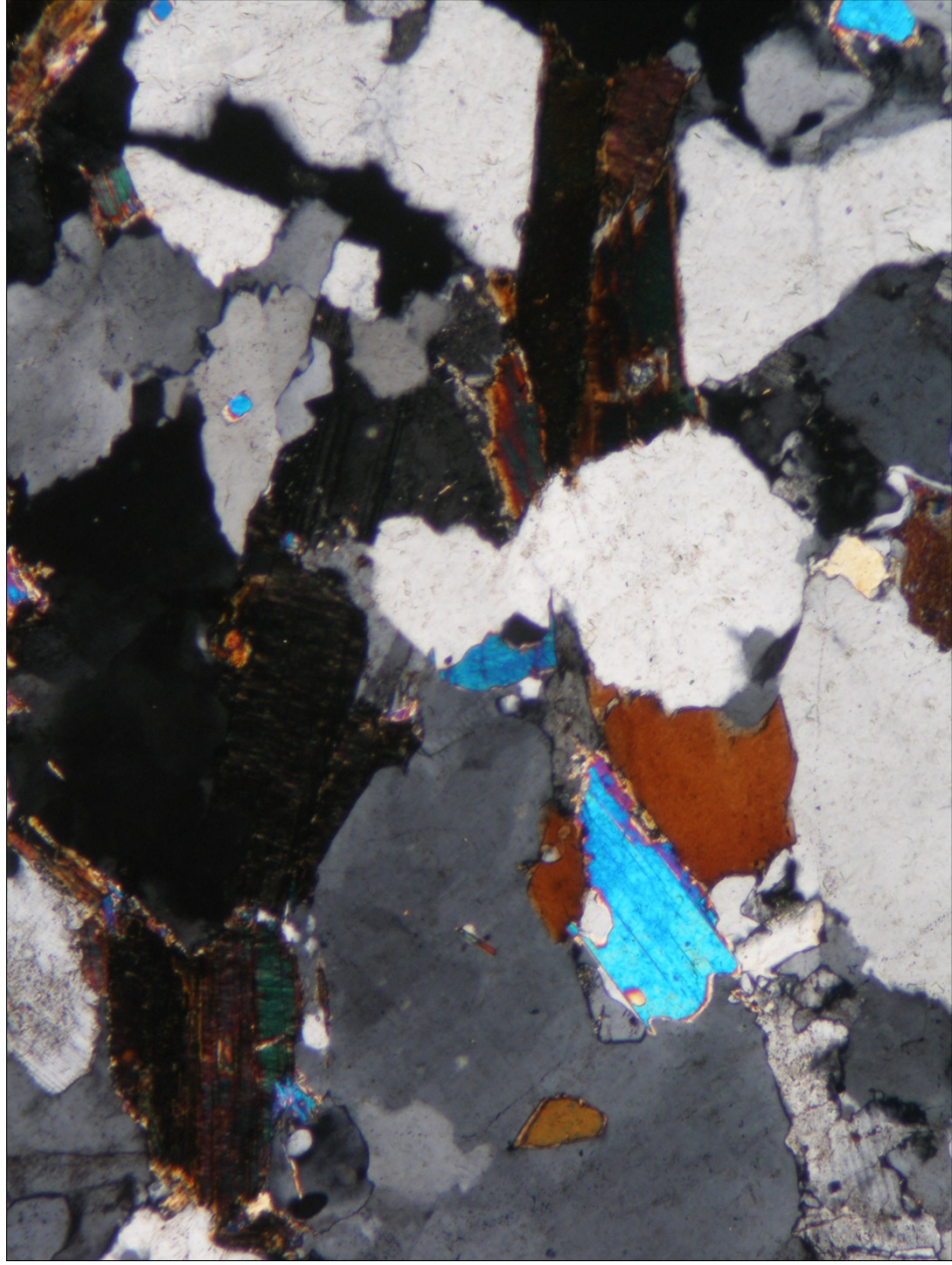
Biotite and muscovite in mica schist from Česká Ves, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.8 mm. Photo: JiZi.



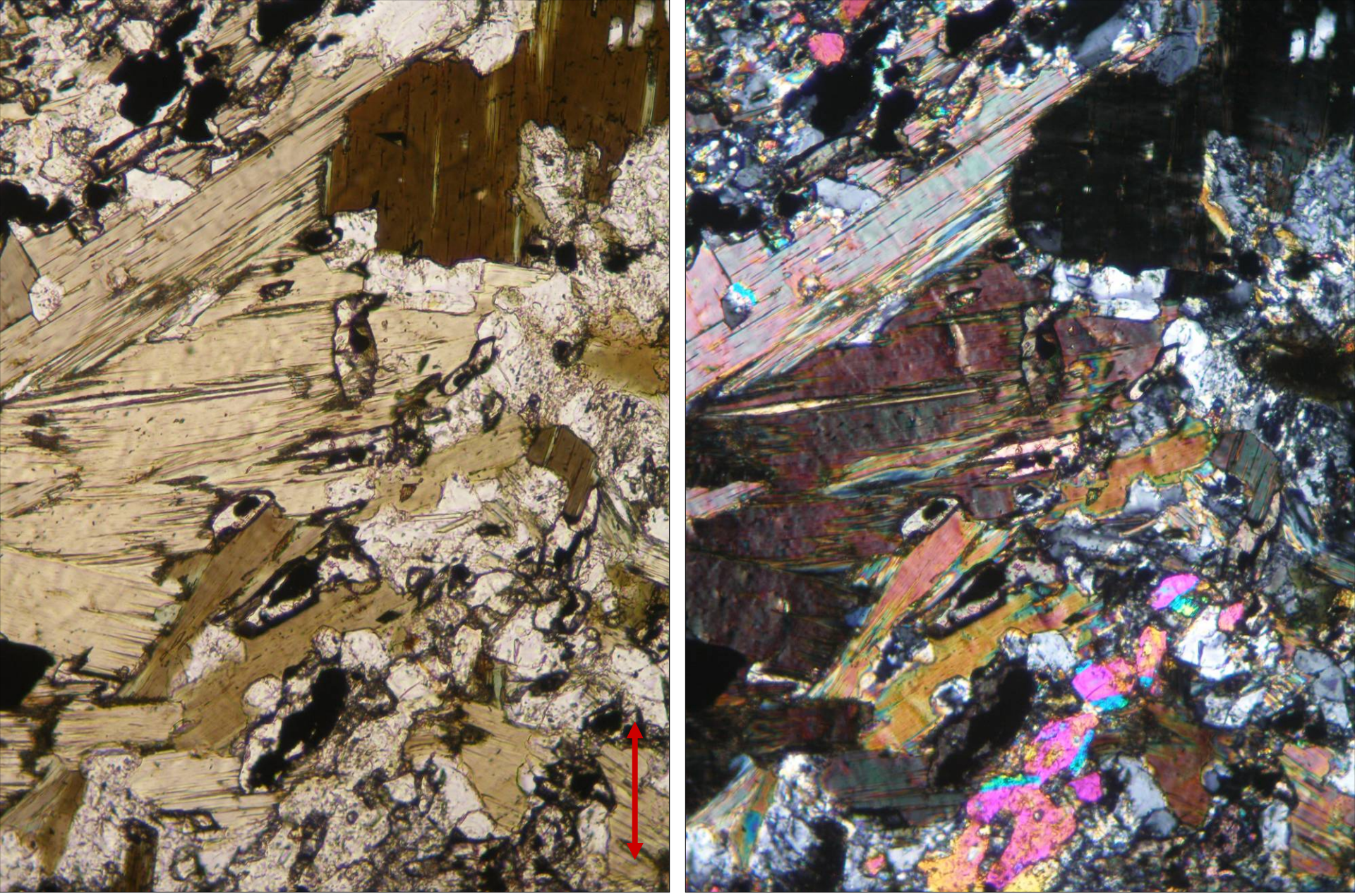


Strong pleochroism of biotite in orthogneiss from Hluboká, the Czech Republic; PPL. Width of fields of view is ca. 1.7 mm. Photo: JiZi.

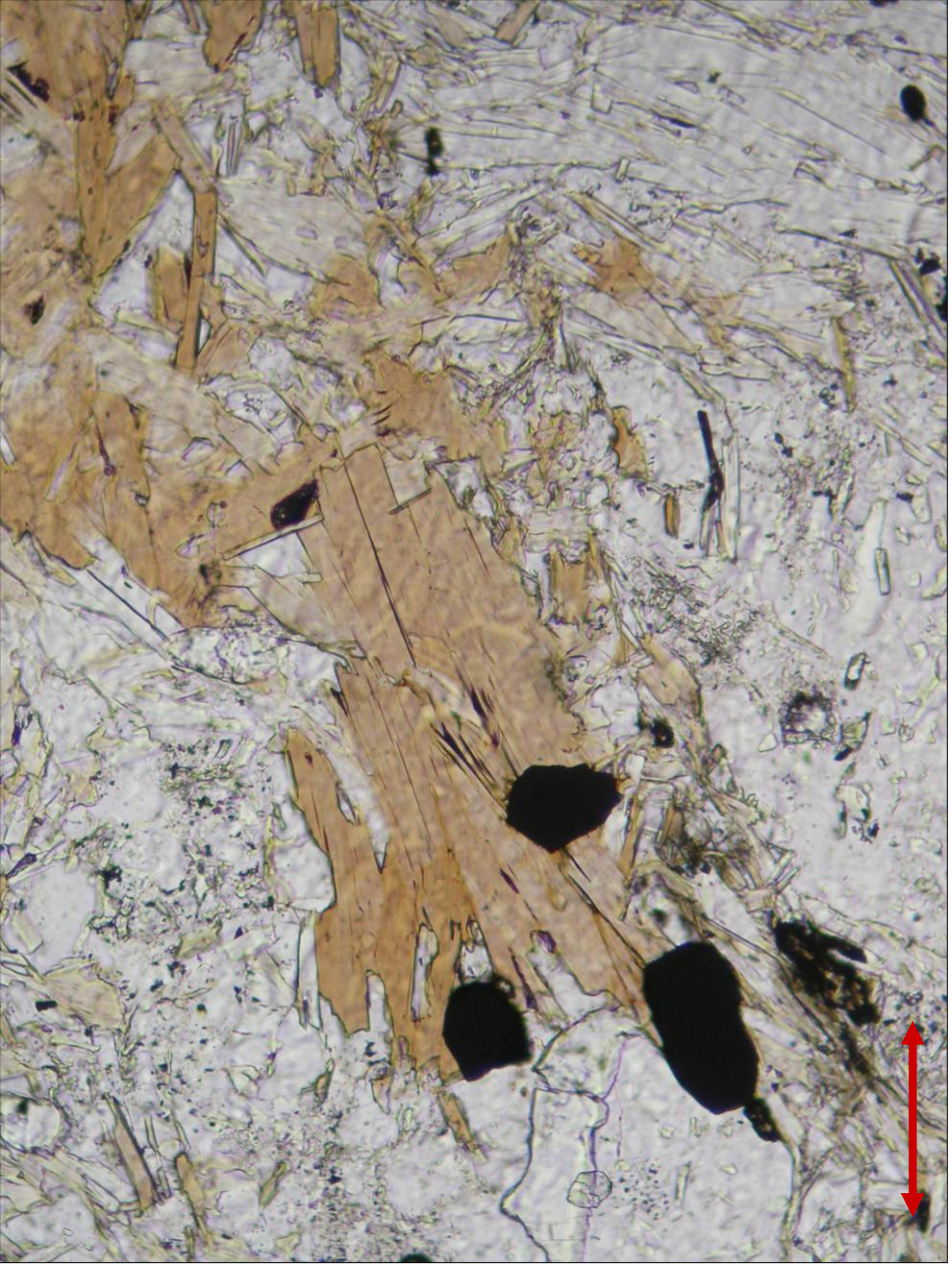


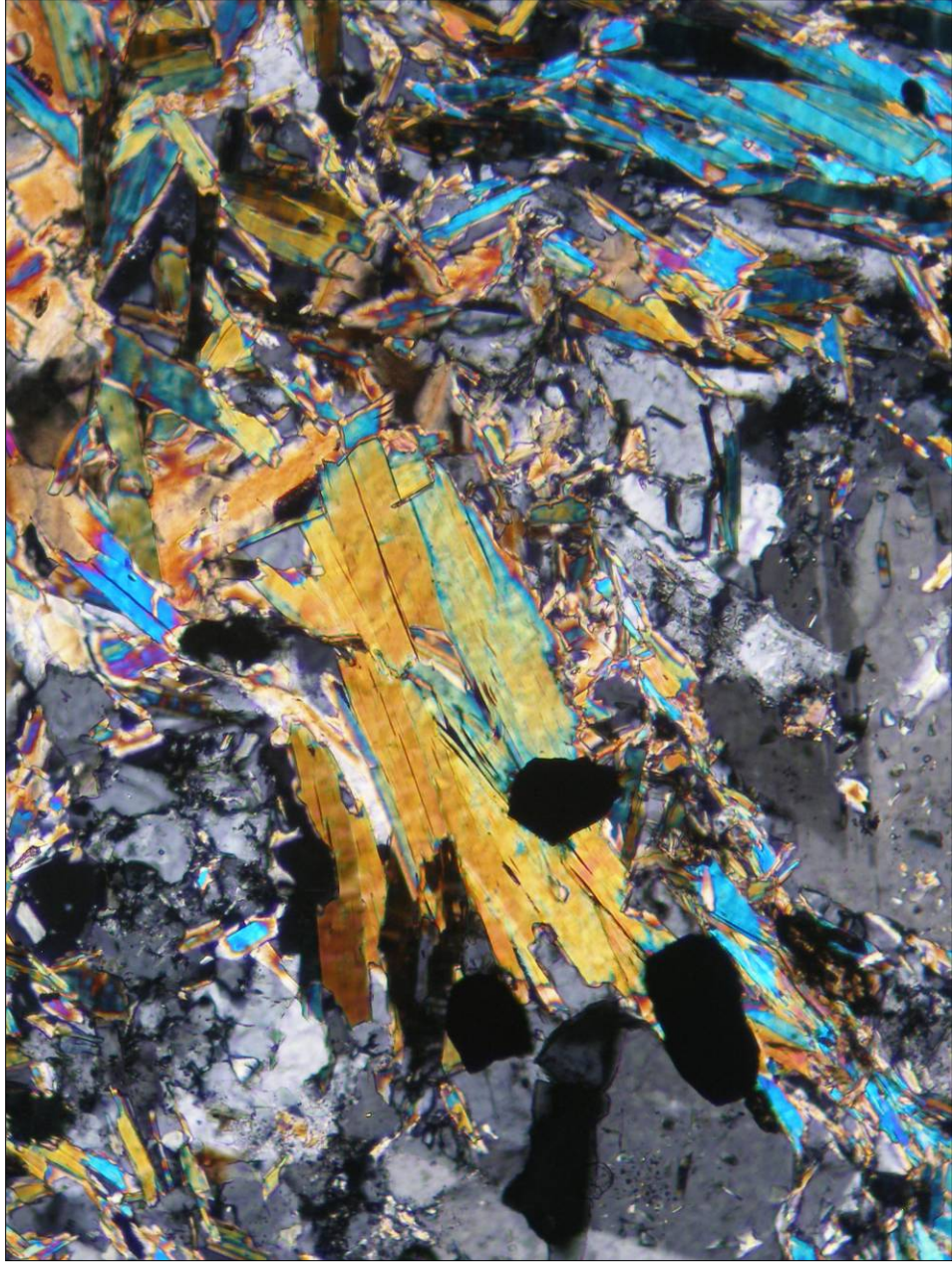


Biotite in orthogneiss from Hluboká, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 1.7 mm. Photo: JiZi.

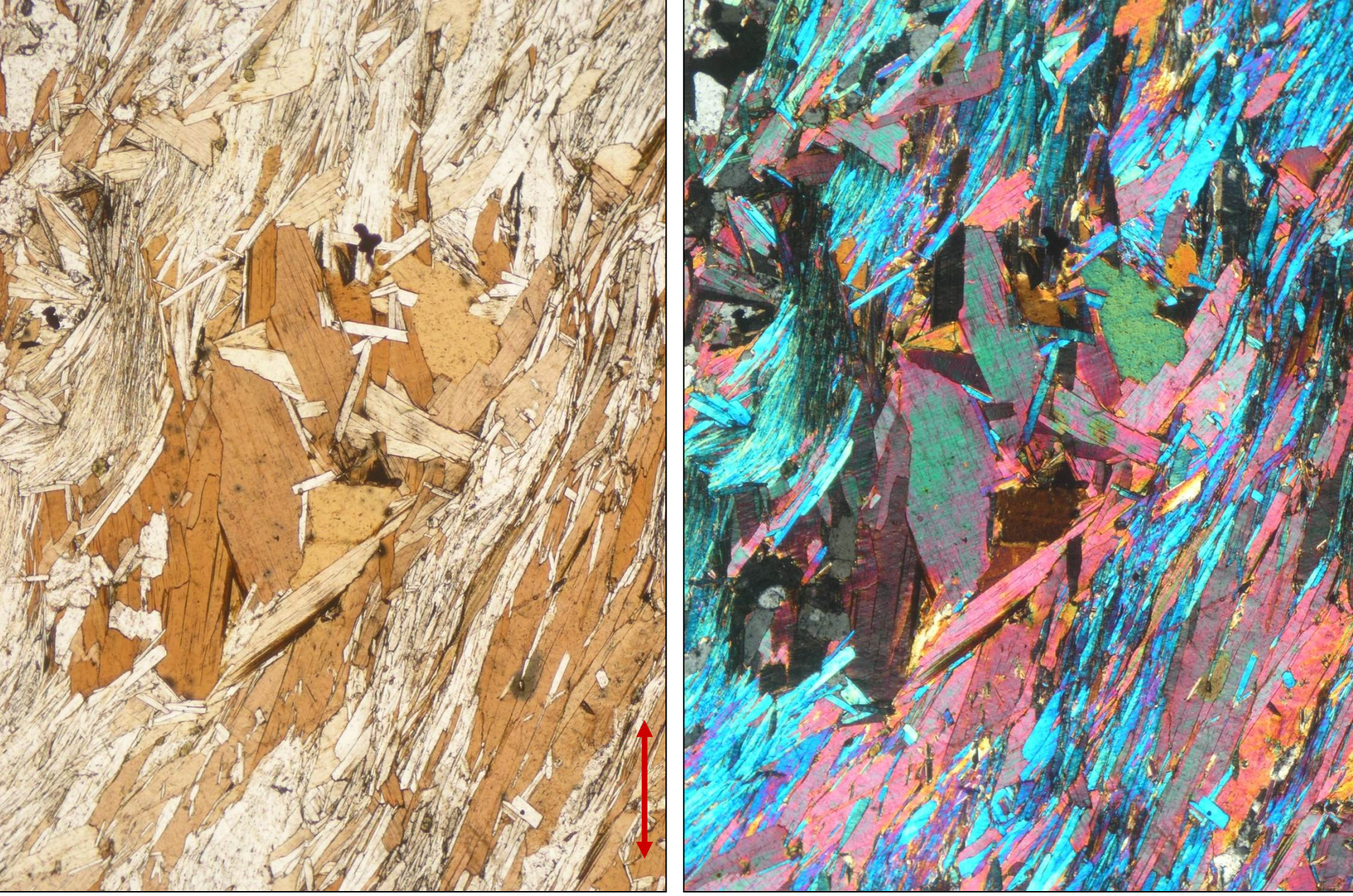


Biotite, epidote, titanite, ilmenite and magnetite in metabasite from Seč, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.7 mm. Photo: JiZi.





Biotite in orthogneiss from Vidly, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 0.7 mm. Photo: JiZi.



Biotite and muscovite in paragneiss from Adolfovice, the Czech Republic; PPL (left) and XPL (right). Width of fields of view is ca. 2.4 mm. Photo: JiZi.