Akcesorické minerály: malé ale dôležité

Accessory minerals: small but important

Pavel Uher

Pavel Uher: CV

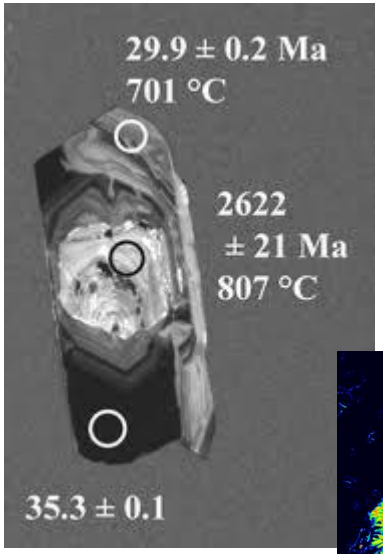
- 1963: born in Bratislava
- 1982-1987: Bc. and MSc. study, Comenius Univ., Bratislava
- 1987 MSc. (RNDr.)
- 1987-1994 Geological Inst., Slovak Acad. Sci., Bratislava
- 1993 PhD. (CSc.): Accessory minerals
- 1994-1996 Dept. of Geol. Sci., Univ. of Manitoba, Winnipeg (Post-Doct. Fellowship)
- 1996-2002 Geological Inst., Slovak Acad. Sci., Bratislava
- 2002-2010 Dept. of Economic Geology, Comenius Univ.
- 2004 Assoc. Prof. (docent)
- 2010-2021 Dept. of Mineralogy and Petrology, Comenius Univ.
- 2012 Professor
- 2021 Dept. of Mineralogy, Petrology and Economic Geology

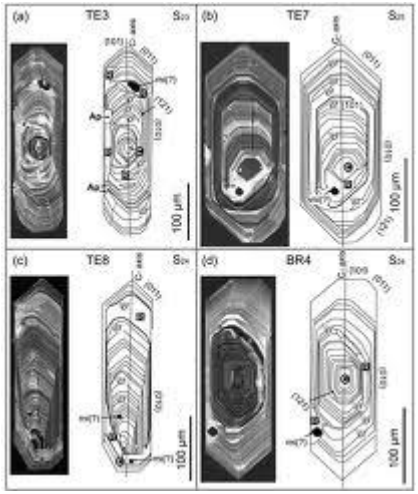
Scientific work and results

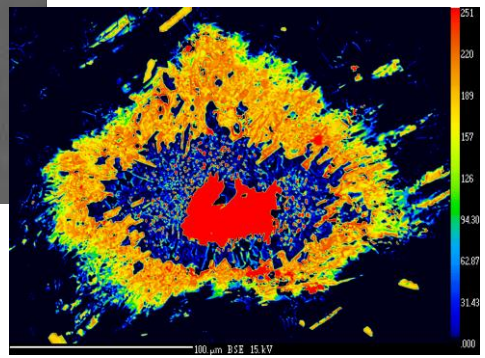
- Accessory minerals in magmatic, metamorphic and hydrothermal systems
- Especially minerals of rare litophile elements (Nb-Ta, REE, Zr-Hf, U-Th, Be, B) in granitic rocks and pegmatites, volcanic rocks, skarns and other lithologies (zircon, Nb-Ta oxides, beryl, monazite, allanite, xenotime, apatite, garnets, tourmalines, titanite, ilmenite, rutile, lazulite, ludwigite, ...)
- Petrochronology of granitic rocks (dating + petrological aspects)
- Mineral nomenclature and classification (tourmaline, beryl groups)
- New minerals: oxy-schorl, fluorarrojadite-(BaNa)
- SCOPUS: 119 papers, ca. 2460 citations, h index = 27; two monographs
- IMA (CNMNC), SMS, SGS
- Editorial boards, reviews, ...

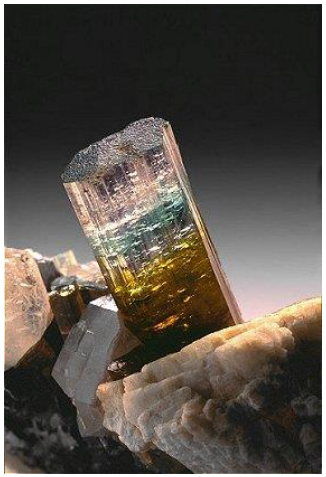
Accessory minerals

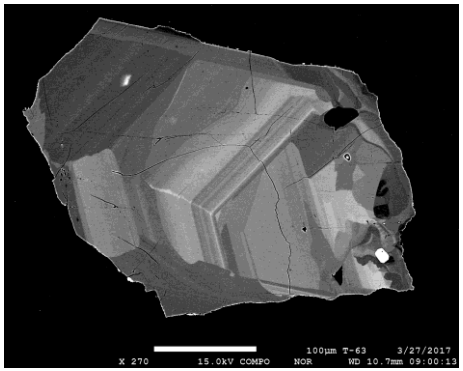
- Usually rare (≤1 vol.%) and small crystals (≤0.5 mm), disseminated in rocks
- Often carriers of rare litophile elements (REE, Nb-Ta, Zr-Hf, U-Th, Be, B, Li...)
- Internal crystal texture (zoning) and variations of chemical composition: perfect tracers of magmatic, metamorphic and hydrothermal evolution or provenance of the host rock
- U-Th-Pb and Sm-Nd dating of accessory minerals: a clue to petrochronological and broader geotectonic interpretation
- Sources of many critical metals, strategic sources for recent civilization





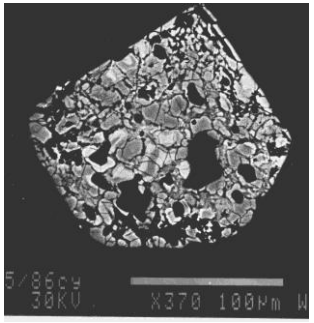


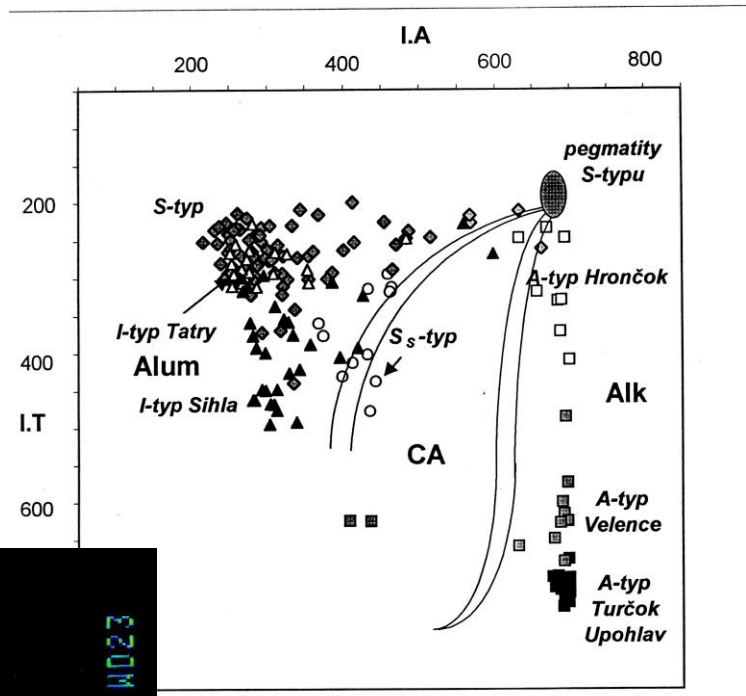


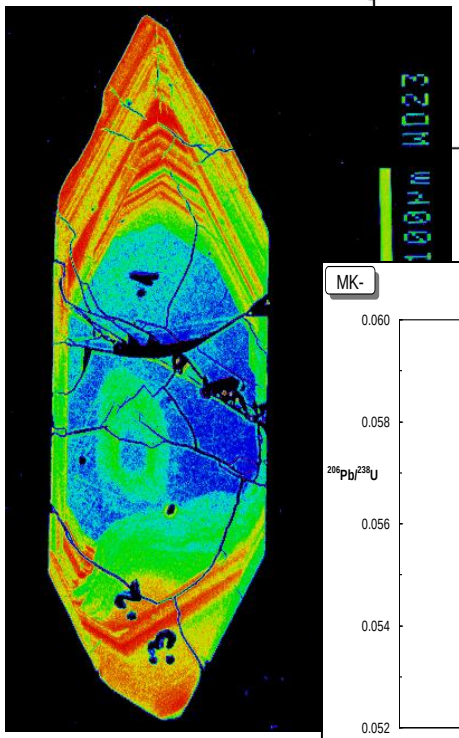


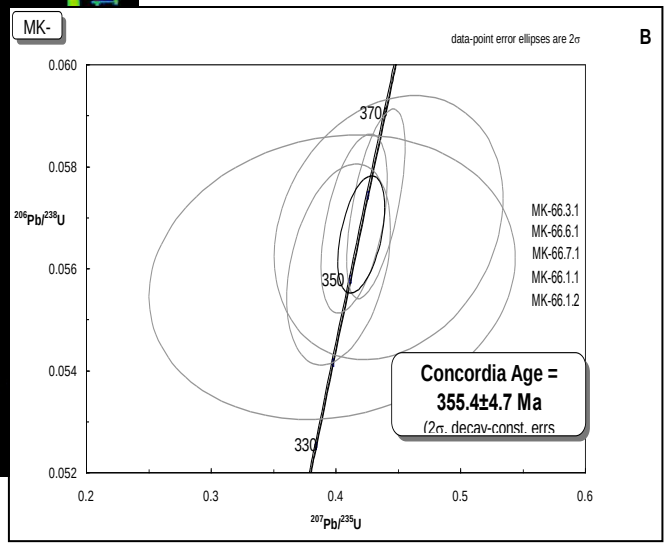
Zircon

- Versatile petrological indicator: crystal morphology, internal magmatic vs. metamorphic/hydrothermal textures, Zr/Hf and Th/U ratio, REE, O and Hf isotopes, geochronology
- Identification of Permian A-type granitic + rhyolitic magmatism in W. Carpathians (260-270 Ma)
- S- versus I-type Variscan granites in W. Carpathians
- Hf and REE in zircon: indicators of barren vs. rare-element granitic pegmatites



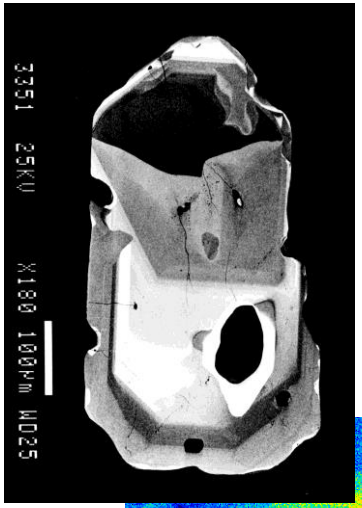


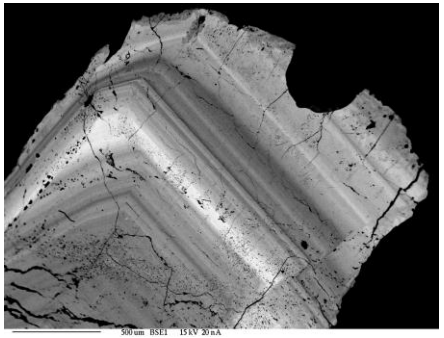


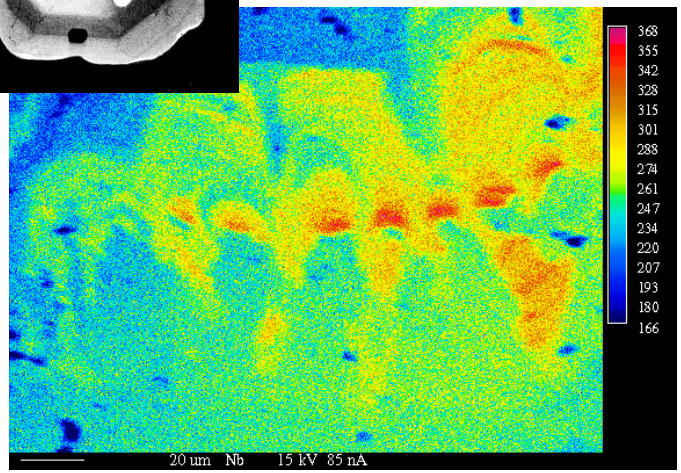


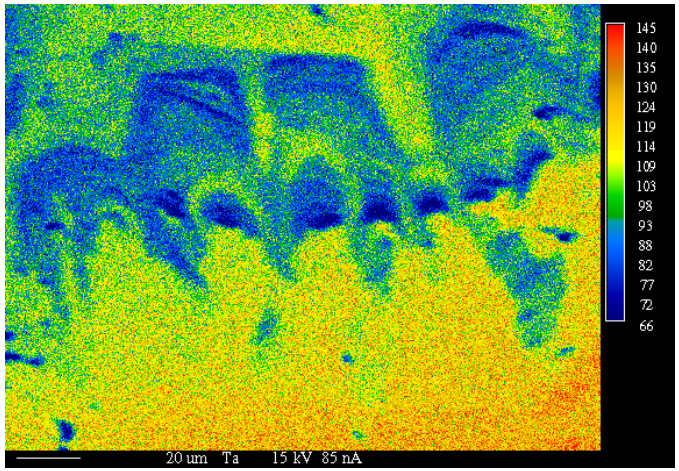
Nb-Ta oxide minerals

- Columbite, tantalite, tapiolite, wodginite, fersmite, pyrochlore to microlite, foordite to thoreaulite (Sn-Nb-Ta)
- Excellent tracers of magmatic to hydrothermal evolution in rare-element granites to pegmatites
- Presence of beryl-columbite subtype, rare-element granitic pegmatites in Variscan W. Carpathian province
- Evolutional trends of columbite-tantalite: Ta/Nb and Mn/Fe increasing during magmatic stage, Ta/Nb decreasing during subsequent albitization
- Extensive hydrothermal alteration of primary Nb-Ta minerals by fersmite and microlite

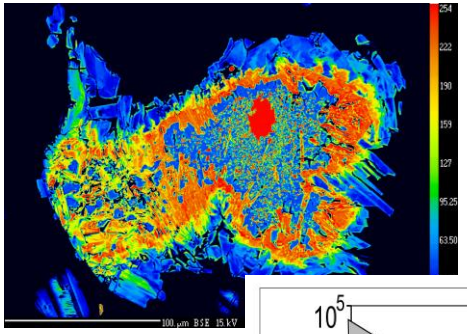


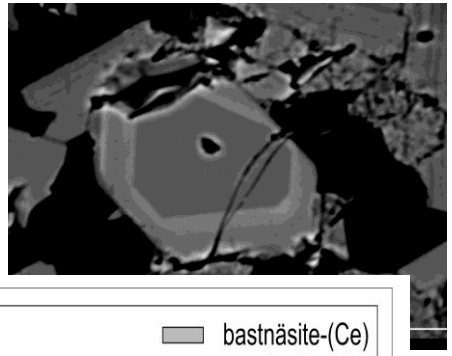




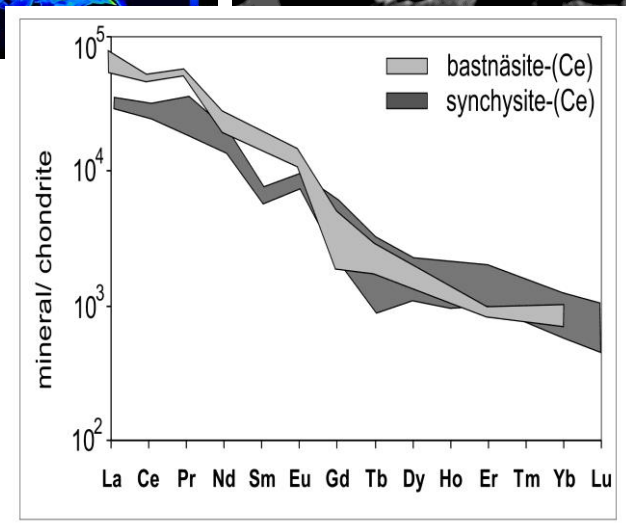


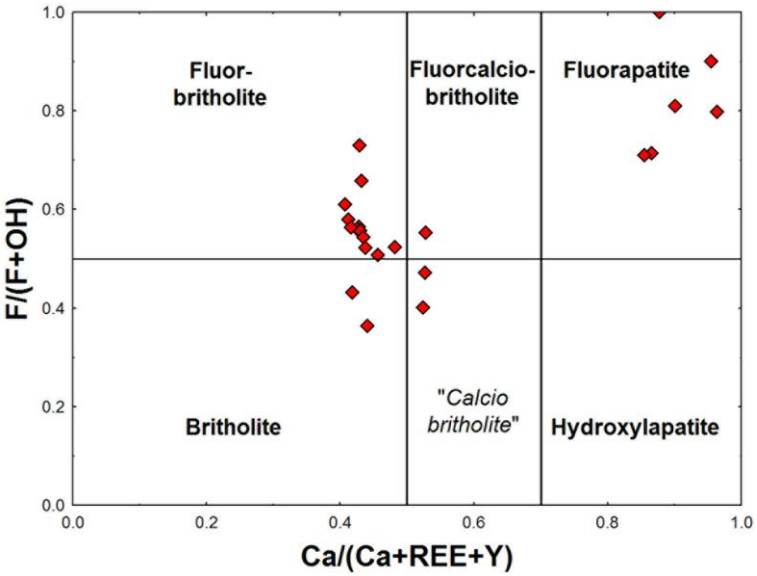
REE accessory minerals





- Allanite-(Ce), monazite-(Ce), xenotime-(Y), britholite group, bastnäsite group, rhabdophane group
- Important markers of P-T-X conditions of the host rocks and their magmatic to hydrothermal and metamorphic evolution; U-Th-Pb dating and petrochronology
- Distinguishing of monazite and allanite granite series + its good correlation to S- and I-type speciation (Variscan orogenic granites)
- EPMA U-Th-Pb dating of monazite: Variscan vs. Alpine ages
- Post-magmatic breakdown of monazite, allanite and xenotime: complex evolution of REE minerals and granitic rocks from Variscan to Alpine stage





Beryl

- Main carrier of Be in magmatic and metamorphic systems
- Beryl composition: indicator of magmatic fractionation and magma origin (Fe, Mg, Cs distribution and variations): beryl evolution trends in pegmatites
- Post-magmatic, fluid-driven breakdown of beryl to phenakite, bertrandite and secondary Qz, Ms and Kfs: tracer of P-T-X and geotectonic evolution of host rocks and complexes
- Beryl transformation to chrysoberyl + Qz: metamorphic to anatectic overprint of pegmatites (≥600 °C)

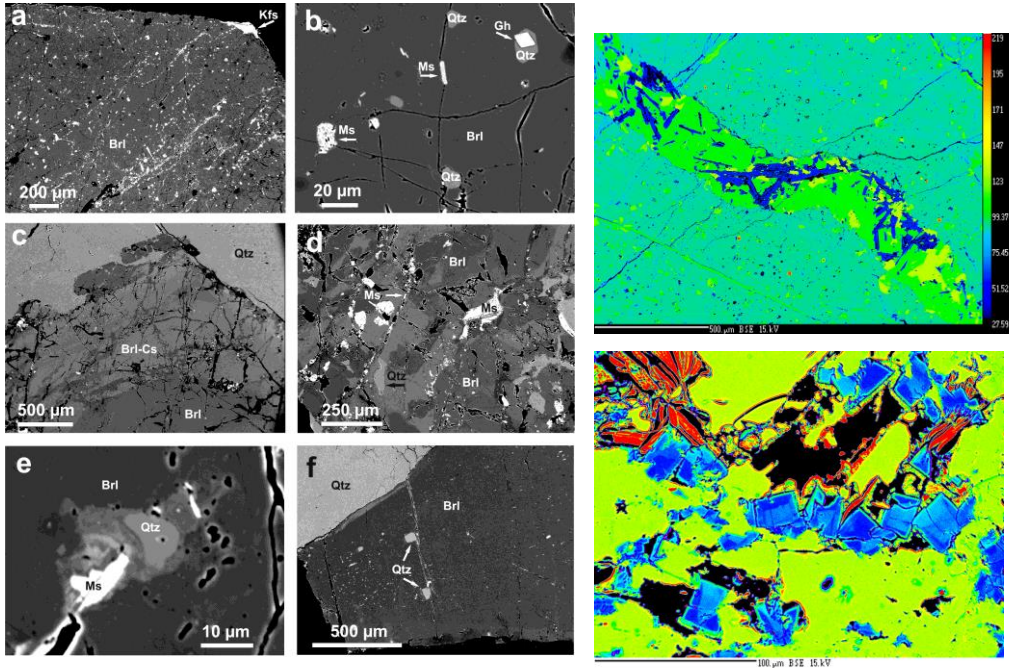
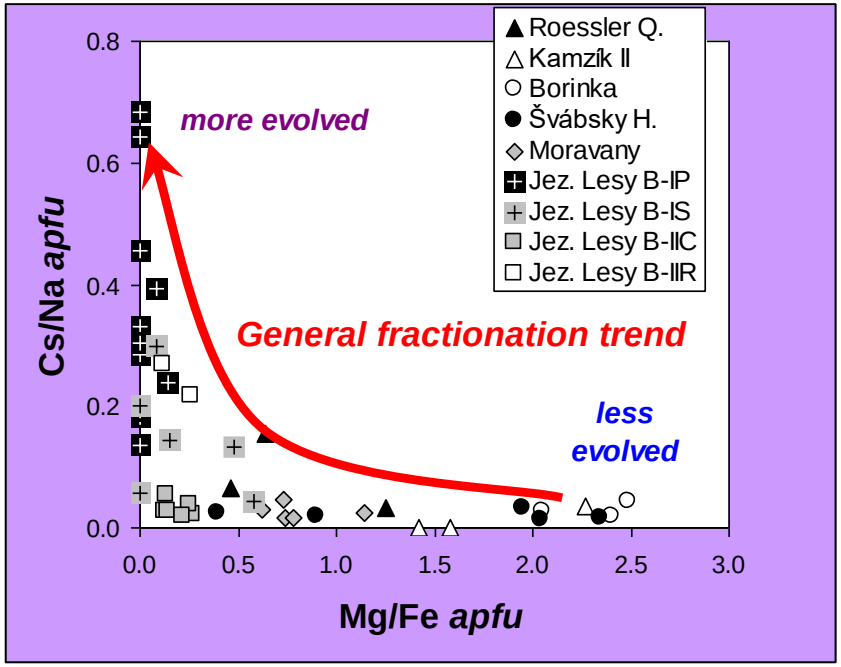
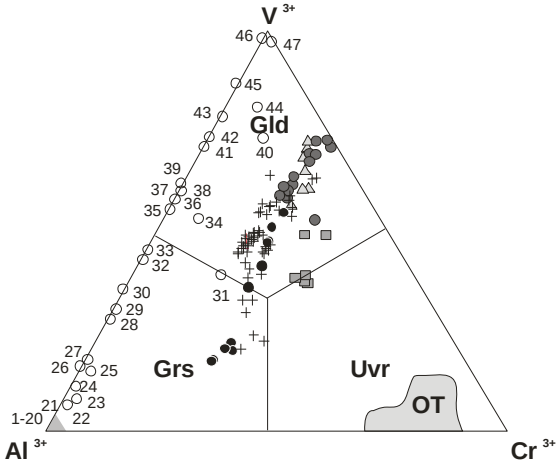


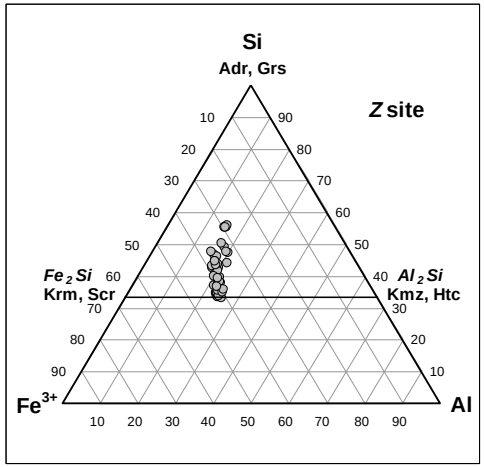
Fig. 3

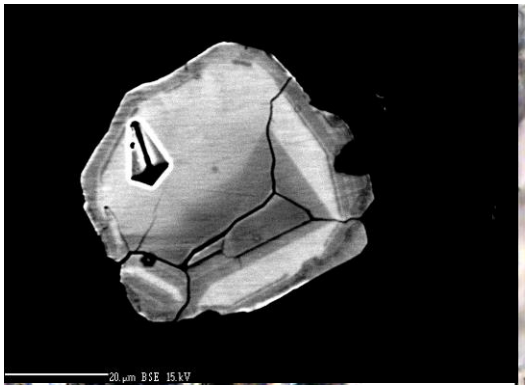


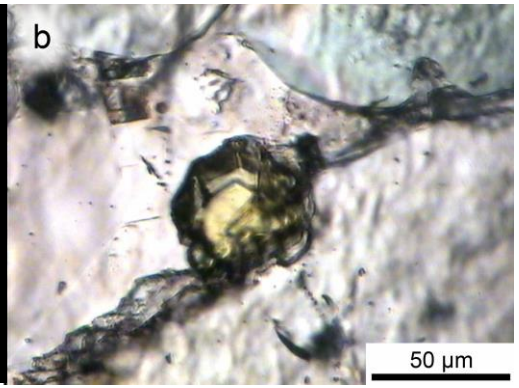
Exotic members of garnet group

- **Goldmanite $Ca_3V_2Si_3O_{12}$ and kerimasite $Ca_3Zr_2(Fe^{3+}{}_2Si)O_{12}$**
- **Goldmanite: index mineral of contact metamorphic overprint of C,V,Cr-rich basic metapyroclastic rocks (black schists); Pezinok, Rybníček**
- **Kerimasite: product of contact metamorphism of limestones in skarn; Vysoká, Zlatno deposit**










Thank you ...