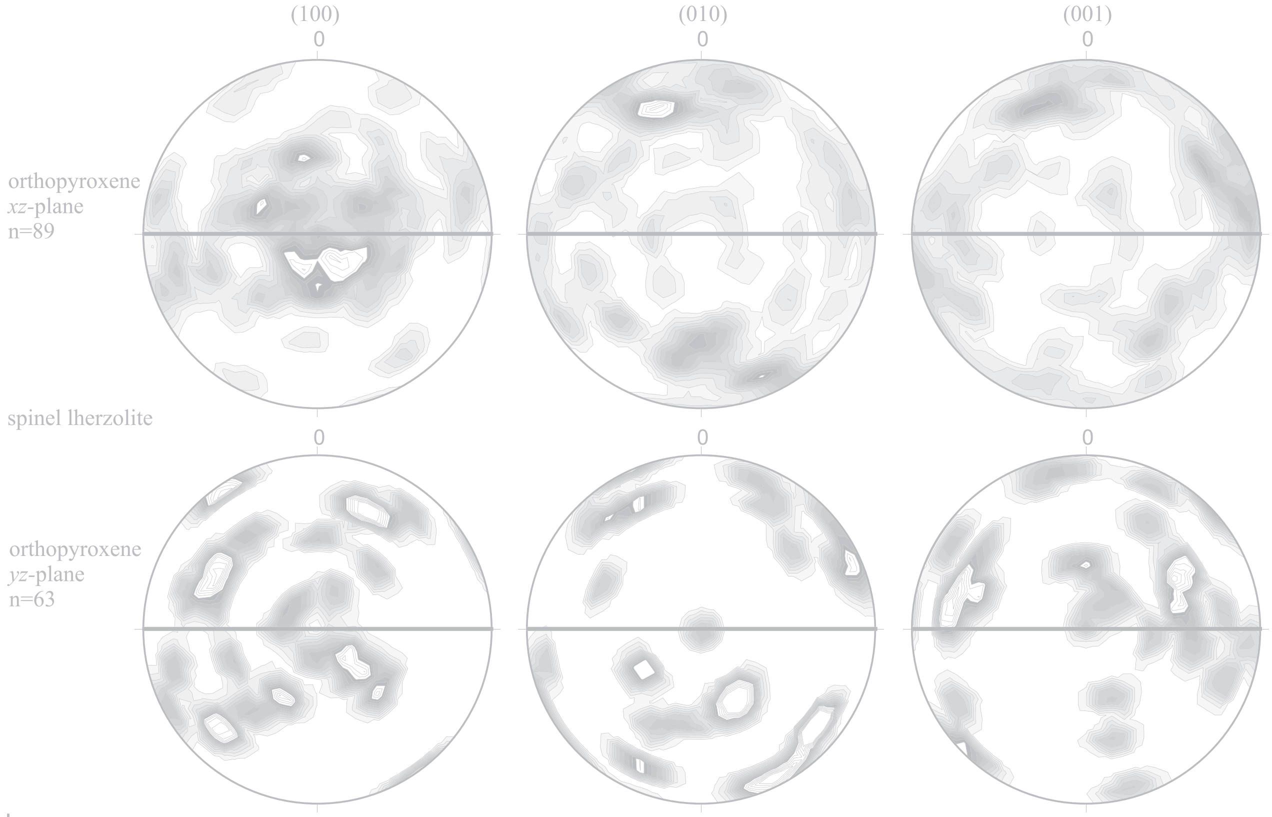

■ **Fig. 2.** Crystallographic preferred orientation (CPO) patterns of orthopyroxene in a studied spinel lherzolite xenolith. Horizontal black lines denotes the foliation, the lineation at 90°/0°. The thin sections had been cut oriented in xz- and yz-planes (i.e. perpendicular to the foliation and parallel to the lineation). Sectioning inaccuracies were corrected by rotating the data. Pole figures are lower hemisphere, equal area projections. n: number of grains measured by EBSD.

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Magnetic Fabric and Ductile Deformation Differences between the Magura and Krosno Groups of Thrust Sheets of the Flysch Belt of the West Carpathians and their Tectonic Implications

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The magnetic fabric in sandstones of the thrust sheets of the Western Sector of the Flysch Belt of the West Carpathians ranges from essentially sedimentary to mostly deformational in origin. In the thrust sheets at the margins of the Flysch Belt (Outer Krosno–Menilite Flysch in the west and Bílé Karpaty unit and Oravská Magura unit in the east), the magnetic fabric is mostly sedimentary in origin, the ductile deformation being very weak, hardly detectable by magnetic anisotropy.

In the central thrust sheets of the Inner Magura Flysch, the magnetic fabric is relatively strongly affected by ductile deformation represented by a combination of simple shear and lateral shortening, probably associated with creation and motion of the thrust sheets driven by a push from the rear side. The ductile deformation is generally stronger in the frontal areas of the individual thrust sheets than in their central areas.

The Krosno lithofacies, mostly occurring in the Outer Krosno-Menilite Flysch, represents the youngest synorogenic flysch sediments largely terminating the last depositional history in the Flysch Belt, embracing the interval from the Late Oligocene to Early Miocene. The deposition of this flysch lithofacies replaced the euxinic sedimentation of underlying Menilite Formation. This change in deposition was connected with Neoalpine orogenetic movements during the Oligocene, which evoked the fundamental re-arrangement of the orogenic belt. In terms of plate tectonics, this re-arrangement represents the stage of closing subduction and starting collision.

Fluid Inclusion, Stable Isotope and Geochronologic Evidence of Cretaceous Collision-Related Formation of Hydrothermal Veins in the Gemeric Basement (Western Carpathians)

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Palaeozoic basement of the Gemeric tectonic unit contains around 1300 siderite-sulphide and quartz-stibnite veins oriented parallel with regional cleavage structure. Origin of the veins has been widely discussed since introduction of modern geochronology methods. Granitic source of ore elements and Cretaceous age of the Gemeric hydrothermal deposits was proposed by Varček (1957). Magmatogenic models invoked Variscan granitoids (Ilavský et al. 1977) or deep mafic intrusions of Cretaceous-Eocene age (Rozložník 1989) as the main sources of ore elements. Metamorphogenic models favoured mobilization of the ore elements during Variscan (Grecula 1982) or Alpine (Varček 1985) tectono-metamorphic processes.

Žák et al. (1991) and Grecula et al. (1995) proposed a metamorphic-hydrothermal model, according to which precipitation of the Gemeric hydrothermal veins was induced by mixing of Variscan metamorphic fluids with evaporite-leaching meteoric waters within Permian rifts. High bromine concentrations in the ore-forming fluids (Hurai et al. 2002) ruled out the presence of evaporite-leaching meteoric water, which was replaced by residual, halite-fractionated seawater infiltrating the Palaeozoic basement from the periodically swamped and evaporated Permian rift/graben in the last versions of the metamorphic-hydrothermal model (e.g. Radvanec et al. 2004, Grecula and Radvanec 2005).

Available stable isotope and fluid inclusion data from the Gemeric hydrothermal veins (Hurai et al. 2002, Urban et al. 2006) are controversial with the concept of rift-related metamorphic-hydrothermal origin. Recalculations based on new fluid inclusion and stable isotope data define formation temperature of 177 to 217 °C, paleodepth of 6.0 ± 0.3 km, and thermal gradient of 33.5 ± 5.5 °C/km for the siderite stage of the Droždiak vein in the northern part of the Gemeric unit. The temperatures of 227–263 °C, paleodepth of 11.2 ± 0.6 km, and thermal gradients of 22 ± 3°C/km have been obtained from the siderite veins in the Rožňava ore field of the southern Gemeric unit. Uniform character of primary fluid inclusions in siderite, i.e. NaCl-CaCl2-H2O brines with salinities between 18–25 wt.% NaCl equivalents, and oxygen isotope composition of the parental fluid positively correlated with the metamorphic grade of country rocks (from 5 ‰ in low-grade Permian to 11 ‰ in medium-grade Lower Palaeozoic rocks) are reminiscent of a closed, rock-buffered fluid system. The normal-to-low thermal gradients and paleodepths substantially exceeding available thicknesses of overburden during Permian-Triassic times rule out opening of the vein structures during the extensional tectonic regime incidental with rifting.

Sulphide stage of the Gemeric hydrothermal veins exhibits highly variable fluid compositions, ranging from high salinity (max. 35 wt.%) NaCl-CaCl2-H2O, CO2-poor brines to CO2-dominated aqueous fluids with signs of heterogeneous trapping. The contrasting fluid compositions indicate an open-system fluid behaviour. In the Cucma stibnite deposit of the southern Gemeric unit located near Roznava town, the carbonic fluid is extremely dense (up to 1.197 g/cm3) and admixture of minor CH4 and N2 is typical. Fluid inclusion trapping *PT* parameters in the Klement vein of the Cucma deposit correspond to 183–237°C, and 1.6–3.5 kbars, possibly up to 4.5 kbars. The *PT* conditions point to a 15–18 km thick overburden and low thermal gradients, corresponding to only 12–13 °C/km (Urban et al. 2006). These parameters are controversial with the partially molten hot continental crust, and up to 7 km thick overburden at the base of the south-Gemeric basement during the Permian-Triassic rifting. Composition of the gaseous mixture is typical of an externally derived metamorphic fluid, and high-salinity aqueous component probably represents basinal brine modified by cationic exchange reactions with crustal rocks.