

FLUID-ASSISTED COESITE-QUARTZ TRANSITION IN THE DORA-MAIRA WHITESCHISTS, WESTERN ALPS: PETROGRAPHIC AND RAMAN STUDIES

Remigi S.¹, Ferrando S.², Frezzotti M.L.³

¹ Department of Earth and Environmental Sciences, University of Milano-Bicocca, Italy

² Department of Earth Sciences, University of Turin, Italy

³ Department of Earth and Environmental Sciences, University of Milano-Bicocca, Italy

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Abstract:

We applied micro-Raman spectroscopy to investigate the kinetic of the coesite-quartz (Coe/Qz) transition in selected samples from the monometamorphic complex of the Brossasco-Isasca Unit, a portion of continental crust that experienced UHP Alpine metamorphism, and that is exposed in the southern sector of the Dora-Maira Massif (Penninic domain). Whiteschists were collected at Case Parigi (Po valley), which represents the locality where natural Coe was discovered and studied for the first time (Chopin, 1984), and near Vanasca and Gilba (Varaita Valley). Dominant mineralogical phases are Prp, Ky, Tlc, Phg and Qz/Coe, in association with secondary Wag, Ell, Mg-Dum, Mg-Chl and accessory Rt, Zrn, Mnz and Ap. In studied rocks, Coe constitutes relics included in Prp, surrounded by radial fractures. SiO₂ inclusions in Prp consist of Coe, preserved in the core, surrounded by polycrystalline Qz and, externally, by *palissade* Qz. Relic coesite is often cut by Qz microveinlets (3-5 μm thickness). Inclusions of Qz as monocrystals, and polycrystalline or *palissade* aggregates are also present in Prp, while polycrystalline and *palissade* Qz are observed in the matrix within the S₁ foliation and in the pressure shadows.

The kinetics of the Coe/Qz transition has been investigated by Raman micro-spectroscopy in inclusions within Prp. Single spectra and spectral maps show that optically-homogeneous Coe in the core of the inclusions often consists of Coe incipiently transformed to quartz (mixed Coe/Qz spectra), in particular close to Qz microveins. At the inclusion rims, spectra of polycrystalline Qz generally do not show Coe vibrations, while about 30% of *palissade* Qz spectra still preserve the main coesite vibration at 521 cm⁻¹, suggesting that locally Si-O-Si bond angles did not attain 144° (i.e., 133° - Coe; Palmeri et al., 2009). Present results indicate that retrograde aqueous fluids catalysed the Coe/Qz transition, incipiently transforming relic Coe into Qtz along microfractures. Completion of the polymorphic transition is attained only at the inclusion rims, testified by *palissade* and polycrystalline Qz.

References

- Chopin, C., 1984. Coesite and pure pyrope in high-grade blueschists of the Western Alps: a first record and some consequences. *Contribution Mineralogy and Petrology*, **86**, 107-118.
- Palmeri, R., Frezzotti, M. L., Godard, G., Davies, R. J., 2009. Pressure-induced incipient amorphization of α-quartz and transition to coesite in an eclogite from Antarctica: a first record and some consequences. *Journal of metamorphic Geology*. doi:10.1111/j.1525-1314.2009.00843.x