Geochronology aimed pre-examination of zircon crystals from Variscan granitoids by combination of EPMA, Raman and PL spectroscopy

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Zircon is the most common mineral used in geological dating methods (U-Pb, Th-Pb), because it preserves the traces of different geological processes in its texture. This property of the zircon crystals results inhomogeneous grain textures, which we need to characterize for proper time-resolved and reliable zircon age determination. Therefore we can not ignore the complex textural and chemical examinations of zircon crystals before dating.

We studied accessory zircon crystals with different morphological types (normal - S_{24}, flat - AB_5, elongated - P_5) [1] in Variscan K-Mg-rich granitoids from southern Hungary (Mórágy) and Austria (Rastenberg). Zircon crystals show both primary (growth/sector zoning ± xenocryst core) and secondary (convolute) zoning features [2]. We have carried out detailed analysis of the zones of these zircon crystals. For determining the chemical composition [3] of the zircon zones electron probe microanalyses (EPMA) were used. In addition, we have executed analyses by Raman and photoluminescence (PL) spectroscopy. First we have determined the structural state [4] of zircon zones. These data confirm that SEM-BSE contrast predominantly depends on the structural state of the zircon zones [4] if strong differences in structural state are present; however, if structural variation is limited (within ±1–2 cm^{-1} Raman FWHM) the SEM-BSE contrast depends mainly on changes in chemical composition (U, Th, REE). Finally, we mapped the photoluminescence emissions (Nd^{3+}, Dy^{3+}) in zircon crystals. We observed the emission caused by REEs related to the textural features of zircon. We could identify two distribution „types" (core, sector zoning).

After this pre-examination method we can mark the promising spots (areas of some micrometres–some ten micrometres in diameter) in the zircon crystals for reliable and geologically well interpretable age data determination.

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