Complete solid solutions between muscovite and Ba-rich white micas were observed since Ba contents range from 0.07 wt.% up to 13.38 wt.% BaO. The micro-Raman spectra of the Ba-rich white micas correspond well with the standard muscovite pattern. The comparison between micas with lower (0.07- 0.26 apfu) and higher (0.29-0.37 apfu) Ba contents yielded that the peaks at 265 cm^{-1} and 396 cm^{-1} show a distinct shift as a function of the Ba content of the micas.

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Major, minor and trace element variations of apatite and tourmaline as a function of metamorphic grade in the contact aureole of the Lienz/Edenwald tonalite

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The distribution of major and trace elements in accessory minerals can provide important information on the metamorphic evolution of rocks. The aim of this investigation is to evaluate the influence of increasing temperature on the chemical composition of apatite and tourmaline using samples along a well defined profile within the contact aureole of the Oligocene Lienz/Edenwald tonalite. Minor element variations in apatites do not seem to vary systematically, but a distinct increase towards the contact was observed in Mn, Cl and ΣREE + Y. The increasing incorporation of REE + Y can be described by the coupled substitution $(REE + Y)^{3+} + Na^{+1} = Ca^{2+}_{-2}$. The major anion constituents, F and OH, show a systematic variation with respect to the metamorphic grade. On the other hand Cl does not vary consistently, although an overall increase towards the contact was observed. The elevated Cl contents in the innermost part of the aureole closest to the pluton probably results from the circulation of hydrothermal fluids associated with the intrusion process.

In contrast to apatites, tourmalines from this contact aureole are characterized by complex textural zoning, which is also reflected in strong chemical zoning. This zoning pattern displays at least two main growth events, where the inner rim shows higher Al[T], Ca and Ti contents and lower Si, Mg[Y] Al[Y] contents compared to the composition of the core and outer rim. With increasing metamorphic grade the tschermak-substitution becomes more significant (HENRY & DUTROW 1996), which results in higher amounts of Al and lower Si and Mg contents. The chemical zoning of the investigated tourmalines can thus be interpreted as a prograde growth sequence from the core (probably Variscan metamorphism) to the inner rim and growth during decreasing metamorphic grades from the inner rim to the outer rim. This chemical trend can be observed in all contact metamorphic samples throughout the contact aureole.

This study shows that accessory minerals do provide important information concerning 1.) the extent of a thermal overprint, 2.) the polymetamorphic nature (tourmaline) of rock samples as well as 3.) evidence of episodes of localized fluid/rock interactions (apatite).

Cracked pebbles - a gauge to constrain overburden

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Brittle, radially fractured pebbles from unconsolidated sediments were investigated in a gravel pit south of St. Margarethen (Burgenland, Austria). The outcrop is located in the Neogene Eisenstadt-Sopron Basin, which is a subbasin on the SE border of the Vienna Basin. The sediments, which were deposited during the Sarmartian and Pannonian (12.7-7.2 Ma), represent a succession of deltaic gravels with intercalations of shallow-marine calcareous sands. Extensional tectonics in these sediments resulted in the generation of conjugate sets of predominately WNW- and subordinate ESE-dipping normal faults (shear deformation bands). These faults were primarily localized in meter-thick gravel layers and, with increasing displacement, eventually crosscut other lithologies.

The gravel layers contain a significant number of cracked pebbles. Detailed structural mapping of the distribution of cracked pebbles revealed their preferential occurrence in the vicinity of the normal faults and, in these, within zones of roughly uniform-sized pebbles. The findings indicated a strong relation to the mechanics of faulting within the sediment. To find the controlling factors for the localization of pebble fracturing, the grain-size distribution and shape and the number of point contacts of the pebbles were statistically measured. The results were then used as input parameters for numerical modelling.

The Discrete Element Method was applied to simulate the effect of overburden on a certain volume of particles (i.e. the pebbles). The magnitude and the distribution of contact forces between the particles were observed and compared with the fracture resistance of natural pebbles, determined by point load testing in the laboratory.

Results from numerical modelling indicate that a maximum estimated overburden of a few tens of meters would not have been able to generate contact forces high enough to crack the significant number of pebbles that have been observed in some parts of the outcrop. We therefore conclude that cracking was related to faulting by force