

Significance of amphibole compositional zoning in para-amphibolite

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Para-amphibolite lenses occur embedded in Devonian metagreywacke in the Libramont region of the Belgian Ardennes. This area belongs to the southern part the Rhenohercynian zone in the mid-European Variscan. Chemically, these amphibolites are characterized by a low alkaline and high Ca content.

The mineralogy of fresh amphibolite comprises garnet, amphibole, epidote, and plagioclase. Biotite, titanite, and pyrite are present as accessories. Amphibole may be partly altered to chlorite. In the examined sample, garnet is basically ternary, $Py_{02-04}Sp_{24-39}Alm_{33-46}Gross_{22-28}$. Mn is decreasing, and Mg is increasing systematically from core to rim. Plagioclase is close to anorthite (An₉₅). Amphibole is calcic, with constant Ca \sim 2 cations (normalized to O=23). In contrast, there is a significant scatter of the Tschermak component in amphibole: Si ranges from 6.5 to 7.8 cations per formula unit. XMg slightly increases from 0.5 in Si poor compositions to 0.7 in Si rich ones. Because of the fibrous habit of the amphibole, systematic compositional zoning is difficult to evaluate. In some cases, Si-rich amphibole replaces Si poor one discontinuously, i.e. Si-rich actinolite represents a clearly later formation.

The P-T conditions of metamorphism have been evaluated by inverse modelling methods, resulting in a temperature maximum of 470 to 500°C at about 4 kbar. In order to assess the significance of chemical zoning in amphibole, *Perple_X* pseudosections (Connolly 2009) have been calculated. Accordingly, Si-poor magnesiohornblende formed at 500°C and relatively high P of \sim 6 kbar. Later increase of Si in amphibole can be related to an essentially isothermal drop of P down to 3 to 4 kbar. Similar values can be obtained applying the various current amphibole solid solution models. It is concluded that the Tschermak content in amphibole has a considerable potential for P estimate in such low-T amphibolite.

Connolly, JAD (2009): The geodynamic equation of state: what and how. *Geochemistry, Geophysics, Geosystems* 10:Q10014 DOI:10.1029/2009GC002540.