

Spodumene pegmatites, pegmatites and leucogranites from the Austroalpine Unit (Eastern Alps)

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In the Austroalpine Unit spodumene-bearing pegmatites occur heterogeneously distributed over an E-W distance of more than 400 km. They are usually associated with barren pegmatites which crystallized in Permian time.

There are two schools of thought about the genesis of the spodumene bearing pegmatites: Economic geologists bring forward the argument that these pegmatites only develop by fractionation of granitic parent plutons, whereas metamorphic petrologists consider that the barren pegmatites and even some highly fractionated pegmatites are products of anatexis of metapelitic country rocks. In the first case the virtual absence of co-genetic fertile granites in the Austroalpine units render the model problematic, whereas in the second case the formation of suitable Li-enriched pegmatitic melts is not yet understood.

A new understanding of the Austroalpine basement through geological mapping and geochronological and geochemical investigations during the past few years gives the opportunity to reinvestigate this problem: In Permian time the Austroalpine unit was affected by lithospheric extension, causing basaltic underplating, high temperature/low pressure metamorphism and intense magmatic activity (Schuster and Stüwe, 2008). The Permian P-T-t path is characterized by heating at slightly decreasing pressure.

Sm/Nd garnet ages on barren pegmatites are in the range of 247 to 288 Ma (e.g., Thöni and Miller, 2000). New age data on three spodumene pegmatites yielded 263±8, 265±3 and 268±2 Ma whereas for leucogranites ages of 259 to 287 Ma were determined.

Muscovites from more than 450 samples of barren pegmatites, spodumene pegmatites and leucogranites and migmatitic mica schist were investigated with respect to their chemical composition. With respect to the pegmatite classification diagrams of Černý and Burt (1984) muscovites from barren pegmatites and migmatitic mica schist mostly plot in fields of muscovite bearing (MSC) and muscovite barren (MSCB) pegmatite classes. Leucogranites plot together with higher evolved barren pegmatites, whereas spodumene pegmatites reach the fields of moderately evolved pegmatites. Even though the spodumene pegmatites are far away from highly fractionated pegmatites.

All in all, pegmatitic melts formed by regional anatexis during the Permian event. Melt accumulation and fractionation via crystallization of barren pegmatites and leucogranites lead to the formation of spodumene pegmatites.

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