

Spodumene bearing pegmatites in the Austroalpine unit (Eastern Alps): Distribution and new geochronological data

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In the Austroalpine unit of the Eastern Alps 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. The Permian P-T-t path is characterized by heating at slightly decreasing pressure.

In an ongoing project additional spodumene bearing pegmatites have been discovered and some of them show temporal and spatial relations to relatively small leucogranitic bodies. New Sm/Nd data prove a Permian age for spodumene bearing pegmatites and leucogranites supporting a genetic relation with the barren pegmatites. Mapping revealed certain relations of pegmatites and distinct country rocks. Units of migmatitic mica schists with lots of interlayered barren pegmatites represent areas with aborted melt generation. In some places the melts accumulate forming inhomogeneous leucogranitic bodies. Examples are the Martell granite (South Tyrol) as well as leucogranites near to Uttenheim (South Tyrol), Geisrücken near to Judenburg (Styria) and Koralpe near to Deutschlandsberg (Styria). Areas with spodumene bearing pegmatites and other well fractionated pegmatites represent structurally higher levels. Spodumene bearing pegmatites mainly occur within the Koralpe-Wölz Nappe System. The biggest are situated in the Hohenwart region/Niedere Tauern (Styria), Falkenbergzug near Judenburg (Styria), Lachtal region/Niedere Tauern (Styria), Weinebene/Koralpe (Carinthia) and in the Defreggen Valley (East-Tyrol).

Further investigations will deal with the processes of melt production, melt accumulation, melt fractionation and the regional fractionation trends within pegmatite swarms.