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Blastomylonites of the Paleoproterozoic Loftahammar-Linköping Deformation Zone (LLDZ) in southern Sweden, evidence for syndeformational alkali-metasomatism

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The “Loftahammar-Linköping-Deformation Zone” (LLDZ) is part of a prominent NW- striking dextral transpression zone within the Paleoproterozoic of the Baltic Shield, which marks the transition between the Svecofennian domain to the north and the Transscandinavian Igneous Belt to the south. The investigated mylonite samples were collected from a road-cut near the village of Hallmare, approximately 4 km SE’of Loftahammar.

Macroscopic structures indicate that ductile shearing was temporarily accompanied by K-metasomatism resulting in episodic meta-blastesis of K-feldspar, in particular during intervals of reduced tectonic activity. Depending on their relative age, these K-feldspar porphyroblasts show extreme strain variations even within the same mylonitic layer, ranging from nearly- undeformed crystals (late porphyroblasts) to completely recrystallized ribbons (early porphyroblasts or possibly primary phenocrysts).

At micro-scale, element mapping reveals that dynamic recrystallisation of feldspars was not only associated with K- but also with Na-metasomatism. This follows from the observation that K-feldspar is partly recrystallized to Na-rich plagioclase and, to a lesser extent,vice versa. Porphyroclasts with composite rims of recrystallized grains display early-formed K-feldspar in the inner zones and younger plagioclase in the marginal zones, indicating that metasomatism was initially controlled by K-rich and later on, by Na-rich fluids. This succession is also confirmed by subsequently-formed,

stress-induced myrmekite. Mobilization of Fe and Ba is observed in recrystallized domains. In strongly deformed fabric domains, polycrystals of K-feldspar, quartz, and mica display pronounced textures (lattice preferred orientations), which point to an oblique-slip displacement during early strain increments.

Since the ratio of primary K-feldspar phenocrysts to secondary K-feldspar porphyroblasts is unclear, the original composition of the protolith is questionable. Significant amounts of amphibole, biotite and sphene within the fine-grained, dark matrix may point to an original I-type granitoid. These observations provoke the question, to what extent K-metasomatism and related metablastesis have shifted large rock volumes to more felsic compositions even at regional scale. Until now, these processes have not been sufficiently taken into account for this area. However, understanding of these processes is of significance, not only for the interpretation of the deformation mechanisms in these shear zones, but also for regional tectonic models.