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Unusual monazite with high S, Sr, Eu and common Pb contents in ore bearing mylonites from the Schellgaden mining district, Austria

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Ore bearing mylonitic mica schists and aplitic material from the Schellgaden mining district contain monazites unusually enriched in Eu, Pb_{com}, S, Sr, and low in Th, U and Y. The high Pb_{com} contents can be inferred from unrealistically high apparent Th-U-Pb ages and constantly high Pb values, giving rise to flat "isochrones" in Th*-Pb diagrams. The S contents (0.1-7 wt.% SO_3) of the monazite are positively correlated with Sr (0.1-1.5 wt.% SrO) and Ca (max. 3 wt.% CaO) and negatively correlated with P and the REEs indicating the substitution reaction: S^{6+} + $(Ca, Sr)^{2+}$= REE^{3+}+ P^{5+}. Eu values (up to 2.7 wt. % ! Eu_2O_3) in monazite show a slight negative correlation with Ca and Sr and therefore likely entered the monazite mainly as Eu^{3+}. This possibly points to monazite crystallisation under high oxygen fugacity.

The unusually high Eu and Sr contents in the monazite are probably derived from the breakdown of plagioclase during Alpine mylonitic shearing under greenschist facies conditions. The high S and Pb_{com} contents in the monazite are related to syn-mylonitic ore mineralization. Monazite occurs associated with galena, anglesite and pyromorphite. Larger monazite grains, as well as xenotime associated with monazite, show a striking oscillatory zoning. The REE source of the monazite was most probably earlier allanite, as evidenced by microtextures. Relictic allanite is replaced by small monazite grains. In rock domains with a minor ore content, the monazite has lower S contents and much less common Pb, which results in Tertiary Th-U-Pb ages. Furthermore, a positive correlation between Eu and Ca can be observed in the monazite. This

suggests that in these domains Eu^{2+} may have predominated as Eu^{3+}, probably as a consequence of a lower oxygen fugacity.