Low temperature alteration of monazite phenocrysts in pegmatite: a general feature

BERNARD BINGEN[1], ANNE-MAGALI SEYDOUX-GUILLAUME[2,5], FERNANDO CORFU[3], MARTIN J. WHITEHOUSE[4], VALÉRIE BOSSE[5], AXEL MÜLLER[6], DAMIEN GUILLAUME[2]

[1] Geological Survey of Norway, 7491 Trondheim, Norway, & Dept. Géologie, Université de Liège, 4000 Liège, Belgium, bernard.bingen@ngu.no

[2] Univ Lyon, UJM-Saint-Etienne, UCA, CNRS, IRD, LMV UMR 6524, 42023 Saint-Etienne, France, anne.magali.seydoux@univ-st-etienne.fr, damien.guillaume@univ-st-etienne.fr

[3] Department of Geosciences & CEED, University of Oslo, 0316 Oslo, Norway, fernando.corfu@geo.uio.no

[4] Swedish Museum of Natural History, 104 05 Stockholm, Sweden, martin.whitehouse@nrm.se

[5] Université Clermont Auvergne, CNRS, IRD, OPGC, Laboratoire Magmas et Volcans, 63000 Clermont-Ferrand, France, v.bosse@opgc.univ-bpclermont.fr

[6] Natural History Museum, University of Oslo, 0318 Oslo, Norway, a.b.muller@nhm.uio.no

Exceptionally large monazite phenocrysts, up to 20 cm long, from the Evje-Iveland pegmatite field, S Norway, were investigated by SEM, EPMA, SIMS, ICP-MS and ID-TIMS to evaluate their low temperature alteration and geochronology. 17 monazite phenocrysts from 7 pegmatite bodies have a composition dominated by the monazite-(Ce), huttonite and xenotime components, with up to 11% Th and 5000 ppm U. They display a systematic and classical [1] alteration trend characterized by breakdown of the magmatic monazite (Mnz 1) into a variably fine-grained assemblage of secondary monazite (Mnz 2), thorite and xenotime. The U-Pb age of monazite 1 ranges from c. 900 to 911 Ma, implying that different pegmatite bodies have slightly distinct ages. This means that they can not be product of differentiation of a single granite pluton, but rather represent local magma batches formed by anatexis. Alteration involves redistribution of Th, Y, HREE, U, and Pb. U-Pb analyses of secondary monazite define U-loss and common Pb-gain trends, implying largely open system for U and Pb. The age of alteration, whether shortly following intrusion or much younger, can not be constrained. SIMS and ICP-MS analyses of Th-rich monazite are complicated by significant matrix effects. Monazite phenocrysts of pegmatites are too heterogeneous to be suitable as reference material. [1] Seydoux-Guillaume et al., 2012, Chem Geol v 330, p 140.