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Petrography and geochemistry to unravel the genesis of the Larvik Plutonic Complex and its Fe-Ti-P-REE-rich rocks

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Phosphates, recognized by the EU as critical raw material, are most frequently observed and extracted from apatite [$Ca_5(PO_4)_3(F,OH,Cl)$], a common accessory mineral in sedimentary, magmatic and metamorphic rocks. Traditionally considered as less interesting for exploitation due to low P_2O_5 grades, igneous phosphate deposits are still poorly understood, both in terms of sources and formation processes. Yet some deposits show significant enrichments which could possibly become exploitable in the future [1]. Here we investigate the Larvik Putonic Complex located in the Oslo Rift (Norway) and associated Fe-Ti-P-REE mineralizations [1-3]. The relationship between the syenomonzonites and subordinate Fe-Ti-P-REE rocks, as well as their source, remain unclear and several processes have been mentioned such as possible products of fractional crystallization, accumulation, magmatic immiscibility and/or hydrothermal alteration [1,4-10]. To decipher the processes, we focus on detailed mineralogical and petrographic investigations, which shed light on the impact of both fractional crystallization and (late) magmatic processes on apatite distribution. Whole rock major and trace elements chemistry of these rocks is then studied to determine the source of the Larvik Plutonic Complex parent magma and its implementation. Further indications provided by the upcoming analyses will help to understand how the Larvik Plutonic Complex took place and to assess the potential for phosphates (and REE as a byproduct).

[1] Ihlen PM, Schiellerup H, Gautneb H, Skår Ø. 2014. Ore Geol Rev. 58:126–47.
[2] Lindberg PA. 1985. Nor Geol Undersokelse Bull. 402:93–8.
[3] Bergstøl S. 1972. Miner Deposita. 7(3):233–46.
[4] Harlov DE, Andersson UB, Förster H-J, Nyström JO, Dulski P, Broman C. 2002. Chem Geol. 191(1–3):47–72.
[5] Engvik AK, Golla-Schindler U, Berndt J, Austrheim H, Putnis A. 2009. Lithos. 112(3):236–46.
[6] Charlier B, Namur O, Bolle O, Latypov R, Duchesne J-C. 2015. Earth-Sci Rev. 141:56–81.
[7] Duchesne J-C, Liégeois J-P. 2015. Ore Geol Rev. 71:40–56.
[8] Decrée S, Boulvais P, Tack L, André L, Baele J-M. 2016. Miner Deposita 51(4): 453-466.
[9] Decrée S, Cawthorn G, Deloule E, Mercadier J, Frimmel H, Baele J-M. 2020. Contrib Mineral Petrol. 175(4):34.
[10] Coint N, Keiding JK, Ihlen PM. 2020. J Petrol. 00(0):1–39.