Geochemistry of the highly alkaline Loučná Intrusive Complex (Krušné hory Mts., Czech Republic)

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The Oligocene Loučná Intrusive Complex (LIC) belongs to important Cenozoic magmatic/volcanic activity associated with the formation of the Eger Rift system. Three groups are distinguished in LIC: (i) P-rich foidites (>3 wt.% TiO_2, >0.7 wt.% P_2O_5, ∑alk = 7–10 wt.%), (ii) highly alkaline (∑alk = 8–13 wt.%) foidites with low MgO (<3 wt.%); (iii) phonolites and tephriphonolites with high alkalis. The suite shows remarkable decrease of P_2O_5, TiO_2, FeO^t with MgO depletion, implying an important role of fractionation of apatite, titanite and perovskite, which are abundant in (i). Nickel, V, Cr, HFSE and ∑REE contents decrease from (i) to (iii) and, in particular HREE+Y show an abrupt depletion in (iii), as apparent from primitive mantle normalized La_N/Yb_N (15–32 for (i) and (ii) while 40–235 for (iii); [1]). Lithium, Rb, Ba, Sr and Pb show generally incompatible behavior.

Initial $^{87}Sr/^{86}Sr$ data show a very constrained range from 0.7037 to 0.7039 despite the range in elemental contents. These observations support a strictly closed-system behavior of the whole suite during magmatic stage. Preliminary δ^7Li values show a large range (–1.2 to 9.0‰). Interestingly, the variation in δ^7Li does not follow chemical and/or petrological trends, indicating at least some open-system process. This is re-inforced by negative correlation between δ^7Li and [Rb], implying ingress of Rb-rich fluids with progressively light Li, perhaps of crustal origin.

The Sr isotope ratios fall within a range of European cenozoic primitive melts [2], confirming mantle origin of the suite. On the other hand, its major and trace element fingerprint is distinct from other alkaline series within Bohemian Massif neovolcanics [3], only slightly resembling some members of the nearby (open system) Doupovské Hory intrusion [4].

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[1] Lustrino & Wilson (2007) *Earth-Sci Rev* **81**, 1–65; [2] McDonough & Sun (1995) *Chem Geol* **120**, 223–253; [3] Ackerman et al (2015) *Lithos*, **224**-**225**, 256–271; [4] Holub et al (2010) *J Geosci* **55**, 251–278