Melt inclusion studies – a new way to explain the genesis of anorthosite massifs?

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The debate about the genesis and evolution of Proterozoic anorthositic massifs still arrouses controversies among scientists and, recently, ends up with rather discrepant conclusions. Works concerning massif anorthosites were mainly focused on bulk geochemistry [1, 2] with significant support from experimental studies [3, 4].

Analysis of melt inclusions (MI), although technically demanding, have some essential adventages: (1) may lead to description of (sometimes) complex relations between components of the melt, general trend of its differentiation and evolution, (2) can be a tool for direct evaluation of partitioning of the elements between magma and phases present, (3) is a powerful tool for estimating phase relations between melt components in different temperatures. The development of analytical techniques, such as LA-ICP-MS, high-resolution EMP or SHRIMP simplifies MI studies and broadens research possibilities in this field.

As explained by Veksler (2006) plagioclases are fairly good hosts for MI due to their simple chemical composition, transparency and colourlessness (inclusions are easily viewed), as well as broad temperature interval of their crystallization, which allows MI to record a conciderable part of rock evolution. Pyroxenes also commonly contain melt inclusions, but tend to have troublesome properties (they are less transparent and often distinguish the ability to incorporate components that easly re-equilibrate with MI) that makes them a challenging objects of analysis. Nevertheless, MI trapped in both plagioclases and pyroxenes, which do coexist, are worth examining and should not be ignored.

Melt inclusions has been reported in orthopyroxene and plagioclase crystals from Suwałki Proterozoic anorthosite massif in large number. These microscopic samples of melt enclosed in rock-forming minerals, if scrupurously analised, can make up a new contribution to the debate about genesis and evolution of Proterozoic massif anorthosites.

[1] Duchesne et. al. (1999) *Terra Nova* **11**, 100-105.
[2] Bybee et. al (2014) *Earth Planet. Sc. Lett.* **389,** 74-85.
[3] Longhi et. al (1999) *J. Petrol.* **40**, 339-362.
[4] Vander Auwera et. al (1998) *J. Petrol.* **39**, 439-468.