

ОТЗЫВ

члена диссертационного совета на диссертацию Борисовой Евгении Борисовны на тему: «Ставролит: P-T-X условия и закономерности образования (на примере Северного Приладожья и других регионов мира)», представленную на соискание ученой степени кандидата геолого-минералогических наук по научной специальности (1.6.4. Минералогия, кристаллография. Геохимия, геохимические методы поисков полезных ископаемых)

Dear Colleagues,

It is my pleasure to write this report for the Doctoral Thesis of Ms. Borisova Evgenia Borisovna “Staurolite: P-T-X conditions and patterns of formation (the Northern Ladoga region and other regions of the world)” submitted for the degree of the candidate of geological and mineralogical sciences.

The Thesis is well written and logically organized. Each chapter is ended with a short summary of most important findings. The Thesis starts from an informative short Introduction presenting the relevance of the research on staurolite in zoned metamorphic complexes, scientific objectives, research methodology, main scientific results, and defended theses.

Chapter 1 is dedicated to systematic description of staurolite-bearing and associated staurolite-free rocks in the zoned metamorphic complex of the Northern Ladoga region, including their key sampling localities and mineralogical and geochemical characteristics. On the basis of comprehensive analysis of petrological and geochemical data, it is concluded that within the staurolite zone, three different blocks can be distinguished (Western, Central and Eastern), which are separated by major faults. These blocks are characterized by differences in chemical compositions of metapelitic rocks and their constituent minerals.

Chapter 2 investigates P-T conditions and fluids regime of staurolite zone rocks in the study area. The performed research combines thermobarometric and thermodynamic calculations with fluid inclusion data. This chapter in particular examines prograde and retrograde transformations of staurolite including replacement of this mineral by newly formed mineral assemblages. As the result, P-T conditions for the formation of staurolite-bearing schists in the three different blocks were estimated. It is also suggested that an increase of CO₂ content in the metamorphic fluid shifted staurolite-forming mineral reactions towards lower temperatures and pressures.

Chapter 3 focuses on isotopic dating of the formation time of staurolite-bearing assemblages in the study region. Two dating methods (U-Pb for metamorphogenic monazites and Sm-Nd for garnet, staurolite and plagioclase) applied to metamorphic rocks of the Northern Domain revealed age of 1.80–1.79 billion years for the metamorphism, which are consistent with previous geochronological data.

Chapter 4 is dedicated to solving the problem of the ambiguity in the position of the staurolite isograd in the studied zonal metamorphic complex of the Northern Ladoga region. For this purpose, a novel method is proposed for identifying potentially staurolite-bearing rocks by using calculated “petrochemical modules” based on ratios of the main rock-forming chemical components (MgO/CaO, CaO/FM, and Al₂O₃/FM). It is also demonstrated that in order to understand the general patterns of metamorphic staurolite formation in mafic rocks, it is necessary to distinguish subgroups of rocks with different FeO_t/MgO ratio, which fundamentally affects the configuration and number of P-T regions in which staurolite is stable. Interestingly, this relationship is not characteristic for metapelites. It is therefore concluded that thermodynamic modeling of mineral assemblages together with the analysis of rock composition

makes it possible to qualitatively and quantitatively understand patterns of staurolite formation in metamorphic complexes containing rocks of both metapelitic and metabasic composition.

The Thesis ends up with Conclusions, which summarize key findings of the performed original PhD research.

The PhD thesis is of high scientific quality and presents interesting research combining geological, geochemical, geochronological, petrological and thermodynamic modeling approaches. The obtained results are novel and improve our understanding of occurrence of staurolite-bearing assemblages in zoned metamorphic complexes. The conclusions on conditions and patterns of formation of staurolite-bearing rocks in the investigated Northern Ladoga region have broader implications for zoned metamorphic complexes worldwide.

С учетом всего вышесказанного полагаю:

Содержание диссертации (Борисовой Евгении Борисовны) на тему: «Ставролит: P-T-X условия и закономерности образования (на примере Северного Приладожья и других регионов мира)» соответствует специальности (1.6.4. Минералогия, кристаллография. Геохимия, геохимические методы поисков полезных ископаемых);

Диссертация является научно-квалификационной работой, в которой содержится решение научной задачи, имеющей значение для развития соответствующей отрасли знаний, либо изложены новые научно обоснованные технические, технологические или иные решения и разработки, имеющие существенное значение для развития страны.

Нарушений пунктов 9, 11 Порядка присуждения Санкт-Петербургским государственным университетом ученой степени кандидата наук, ученой степени доктора наук соискателем ученой степени мною не установлено

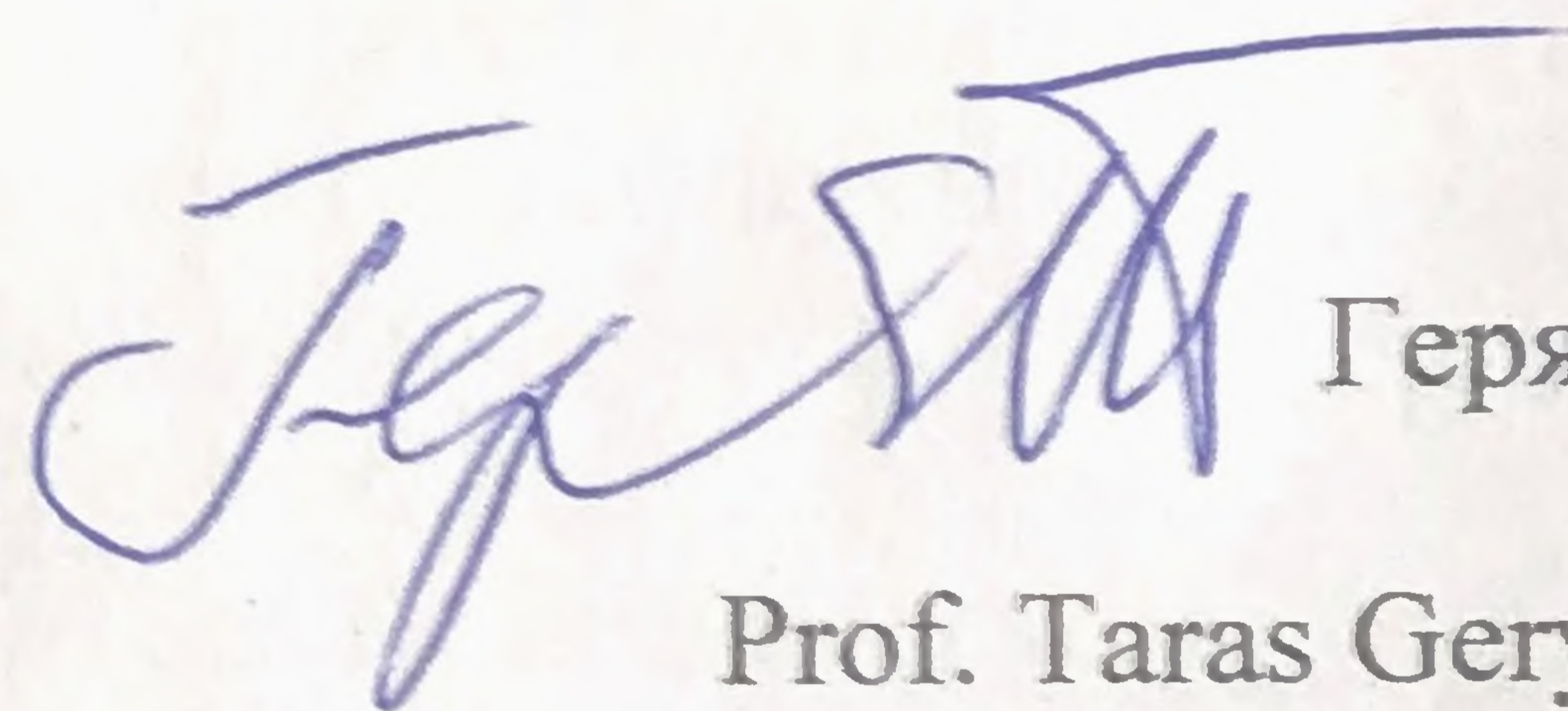
Диссертация соответствует критериям, которым должны отвечать диссертации на соискание ученой степени кандидата наук, установленным приказом от 19.11.2021 № 11181/1 «О порядке присуждения ученых степеней в Санкт-Петербургском государственном университете» и рекомендована к защите в СПбГУ.

Член диссертационного совета

Доктор геолого-минералогических наук, профессор

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10 November 2024

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