Geophysical Research Abstracts
Vol. 21, EGU2019-8766, 2019
EGU General Assembly 2019

The formation conditions of tungsten deposits and their connection with rare-metal peraluminous granites

Elena Badanina, Liudmila Syritso, and Elena Volkova
Institute of Earth Sciences, State University of St.-Petersburg, St.-Petersburg, Russia, e.badanina@spbu.ru

The tungsten distribution in granitoids of the Kukulbei Complex in eastern Transbaikal region results in a high potential of rare-metal peraluminous granites (RPG) for W mineralization and displays a different behavior of W in Li–F and "standard" RPG. These subtypes differ in the behavior of W in melt, spatial localization of mineralization, and the timing of wolframite crystallization relative to the age of the parental granitic rocks.
The significant of W concentration is assumed to be due to fractionation of the Li–F melt; however, wolframite mineralization in Li–F enriched granite is not typical in nature. The results of experiments (Chevychelov, 2013) and our calculations of W solubility in granitic melt show that wolframite hardly ever crystallizes directly from melt; it likely migrates in the fluid phase and is then removes from the magma chamber to the host rocks, where secondary concentration takes place in exocontact greisens and quartz–cassiterite–wolframite veins. The isotopic age of accessory wolframite (139.5 $\pm$ 2.1 Ma) within the Orlovka massif of Li–F granite is close to the formation age of the massif (140.6 $\pm$ 2.9 Ma). In Li–F granites (Orlovka and Sherovogorsky massifs), the time of wolframite crystallization is confined to the interval of rock crystallization. Thus, it can be suggested that the limit of saturation of the granitoid melt with wolframite depends on the Li and F contents therein (Che et al., 2013). The age of columbite–tantalite from the ore zone in the Orlovka massif corresponding to 145 $\pm$ 1.0 Ma allows us to suggest the lack of an appreciable gap between the formation of the massif and columbite–tantalite crystallization.
A different W behavior is recorded in the RPG subtype with a low lithium and fluorine concentration, exemplified by the Spokoinoje massif. There is no significant W gain in the melt. All varieties of wolframite mineralization in the Spokoinoje massif are derived from greisens, veins, and pegmatoids yielding the same crystallization ages (139.5 $\pm$ 1.1 Ma), which are 0.9–1.8 Ma later than the Spokoinoje granite formation (144.5 $\pm$ 1.4 Ma). Perhaps this period corresponds to the time of transition from the magmatic stage to hydrothermal alteration. This is consistent with the commonly accepted postmagmatic nature of wolframite in RPG of the "standard" type.
Comparison of the isotope characteristics (Rb–Sr and Sm–Nd isotope systems) of rocks and the associated ore minerals (wolframite, cassiterite) from all examined deposits shows a depletion in epsilon-Nd values for ore minerals relative to the rock and the opposite behavior for the intial Sr isotope ratios. This may indicate the specific nature of ore matter, where the effect of the juvenile
component is definitely expressed.