Geophysical Research Abstracts,
Vol. 11, EGU2009-12307, 2009
EGU General Assembly 2009

Blocks of Archean material in the structure of the Uralian Platinum Belt: insights from in situ U-Pb (SHRIMP-II) data on zircon from the Nizhny Tagil clinopyroxenite-dunite complex

K.N. Malitch (1), A.A. Efimov (2), and Yu.L. Ronkin (2)

(1) A.P. Karpinsky Russian Geological Research Institute (VSEGEI), Sredny pr. 74, St. Petersburg, 199106, Russia (guli@online.ru/+78123289173) , (2) Russian Academy of Sciences, Uralian Branch, Institute of Geology and Geochemistry, Pochtovy per. 7, Ekaterinburg, 620151, Russia

The Nizhny Tagil massif forms part of the 900-km-long Uralian Platinum Belt (UPB) and represents an undisputable example of a zoned Uralian-type clinopyroxenite-dunite complex (Efimov 1998; Auge et al. 2005). The 47 km^2 Nizhny Tagil massif is almond-shape, shear bounded and enclosed by Riphean and Devonian metasediments to the west and late Paleozoic to Mesozoic predominantly mafic igneous rocks to the east. It consists of a platiniferrous dunite core (Fo_{92-90}), surrounded by a clinopyroxenite rim.

Recently obtained U-Pb and Sm-Nd isotope ages defined the range for UPB complexes between 540 and 425 Ma. Geochronological data for dunite remains scarce being restricted to the Kytlym dunite block (Bea et al. 2001).

To fill this gap, we present the first results of uranium-lead ages for 10 grains of zircon, which were extracted by conventional techniques from course-grained dunite sampled at Alexandrovsky Log in the central part of the Nizhny Tagil massif. Most of zircons are subeuhedral, prismatic (80-170 microns long), with an elongation between 1.3 and 1.6, and oscillatory zoning characteristic of igneous rocks. Majority of zircons yield secondary inclusions; some grains show tracers of subdivision and recrystallization, whereas several grains are characterized by curved external counters pointing to specific condition of their evolution.

U-Pb analyses were performed with secondary ion mass spectrometer SHRIMP II at VSEGEI, following the procedure described by Williams (1998). Concentrations of U vary from 34 to 520 ppm, Th from 18 to 358 ppm. Three age clusters have been determined. Two subordinate groups are characterized by concordant ages of 585±29 Ma (MSWD=1.07, probability (P) =0.30) and 1608±56 Ma (MSWD=0.07, P=0.79), whereas the main data set cluster around 2781±56 Ma. We assume, therefore, that the Late Archean age testifies the timing of dunite generation in subcontinental mantle, whereas the “youngest" U-Pb age might be linked with timing of formation of hot tectonic dunite-pyroxenite-tylaite mixture (so called "hot mélange"). The depleted mantle component of studied dunite is confirmed by Nd-isotope signature ($^{143}Nd/^{144}Nd$=0.514128±0.000037, ID-TIMS). It is noteworthy, that similar U-Pb data (2744±9 Ma) are typical of zircon from dunite of the world’s largest Guli clinopyroxenite-dunite massif in the northern periphery of the Siberian Craton (Malitch et al. 2002).

Frequently the UPB has been considered as a chain of in-situ gabbroic intrusions, where dunite is assumed to represent a cumulate of gabbroic magma. Contrary opinion considers the UPB as a complex tectonically integrated structural unit, which comprise distinct in origin formations (e.g., mantle residual material, products of its abyssal transformation, crystalline metabasites of problematic nature, material of abyssal crystallization of tholeitic magma, products of prograde metamorphism of volcanic crust and later granitoids). In this view, the dunite is accepted as mantle residue with no genetic link to gabbro.

Previous detailed structural, petrographic and geochemical studies confirmed that Uralian-type ultramafic complexes have indistinguishable features with circular Aldan-type clinopyroxenite-dunite massifs (e.g. Kondyor, Chad, etc.), which intruded in ductile-plastic state as mantle diapirs into the Archean crystalline basement of the Siberian Craton and its Riphean cover (Malitch 1999). Compositional identity of dunites in Uralian- and Aldan-type complexes allowed (Efimov, Tavrin 1978) to propose their genetic unity. This implies that Uralian-type dunite bodies can be also considered as mantle rocks. It is less clear, however, how this ancient subcontinental mantle ma-

terial has been integrated into structure of elongated tectonic belts, developed at convergent plate margins (Urals, Koryakia, Alaska, etc.).

References: Auge, T. et al. (2005) Economic Geology **100**, 707-732. Bea, F. et al. (2001) Terra Nova **13**, 407-412. Efimov, A.A. (1998) In: 8th Intern Platinum Symp. Abstracts. 28 June - 3 July 1998. Johannesburg: The South Afr. Inst. Mining and Metallurgy, Symp. Series **S18**, 93-96. Efimov, A.A., Tavrin, I.F. (1978) Doklady Akademii Nauk SSSR **243**, 991-994 (in Russ.). Malitch, K.N. (1999) Platinum-group elements in clinopyroxenite-dunite massifs of the Eastern Siberia (geochemistry, mineralogy, and genesis). St. Petersburg: Saint Petersburg Cartographic Factory VSEGEI Press. 296 p. (in Russ.). Malitch et al. (2002) Mineral. Petrol. **76**, 121-148. Williams, I.S. (1998) Reviews in Economic Geology **7**, 1-35.