СПИСАНИЕ НА БЪЛГАРСКОТО ГЕОЛОГИЧЕСКО ДРУЖЕСТВО, год. 80, кн. 3, 2019, с. 64–65
REVIEW OF THE BULGARIAN GEOLOGICAL SOCIETY, vol. 80, part 3, 2019, p. 64–65

Национална конференция с международно участие „ГЕОНАУКИ 2019“
National Conference with international participation “GEOSCIENCES 2019”

Jurassic detrital zircons from Asenitsa unit, Central Rhodope Massif, Bulgaria

Детритни цирконi с юрска възраст от единицата Асеница, Централни Родопи, България

Milena Georgieva[1], Tzvetomila Vladinova[2], Valerie Bosse[3]
Милена Георгиева[1], Цветомила Владинова[2], Валери Бос[3]

[1] Sofia University “St. Kliment Ohridski”, Tsar Osvoboditel Blvd., 1504 Sofia, Bulgaria; E-mail: milena@gea.uni-sofia.bg
[2] Geological Institute, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Bl. 24, 1113, Sofia, Bulgaria;
E-mail: tz.vladinova@gmail.com
[3] Université Clermont Auvergne (UCA), Clermont Ferrand – France, Campus universitaire des Cézeaux, 6 av. Blaise Pascal;
E-mail: V.Bosse@opgc.univ-bpclermont.fr

Keywords: Asenitsa unit, detrital zircons, U-Th-Pb geochronology, Rhodope massif, Bulgaria.

Introduction and geological setting

Detrital accessory minerals in metasediments and other metamorphic rocks are useful tool to determine the time of sedimentation and the provenance of the sedimentary material. The Asenitsa lithotectonic unit (Sarov, 2012) occupies the highest level of the Central Rhodope metamorphic terrain (Bulgaria) and comprises metaigneous and metasedimentary rocks. Metasediments overlie the gneissic suits and consist of mica schists, calc-schists, amphibolites and thick marbles.Except the early study of Guiraud et al. (1992), yet little is known about the time and P-T conditions of metamorphism in the unit.

Analytical methods and samples description

We present U-PbLA-ICP-MS geochronological data on separated zircons from metasedimentary (garnet-staurolite mica schist) and metaigneous (epidote-biotite schist) rocks of the Asenitsa unit.

The peak metamorphic association in the garnet-staurolite mica schist is garnet, staurolite and kyanite. The high-grade minerals are replaced by abundant muscovite and some chlorite. The garnet porphyroblasts have resorbed rims, numerous quartz inclusions and associate with fragments of staurolite and kyanite. Chloritoid occurs only as inclusions in the central parts of garnets porphyroblasts and is part of the prograde metamorphic association. Muscovite appears both as inclusions in garnets and bands in the matrix, defining the foliation and as large flakes, oriented obliquely to the foliation in the matrix. Chlorite is rare and biotite is observed only as small idioblastic flakes in the quartz bands. Accessory minerals are rutile, zircon, apatite and abundant opaque minerals.

The epidote-biotite schist belongs to the metaigneous part of the Asenitsa unit. The sample is composed of biotite, muscovite, plagioclase, quartz, and abundant epidote. Zircon and titanite are the most abundant accessory phases.

Zircon geochronology and geochemistry

Separated zircon grains from the garnet-staurolite schist are with euhedral to subhedral shape. Cathodoluminescence (CL) images display clearly igneous patterns with homogeneous cores and wide oscillatory rims (Fig. 1a). LA-ICP-MS U-Pb ages group between 140 and 150 Ma (Fig. 1b).The cores yield concordant age of 145.9±1.3 Ma (MSWD= 1.1, Th/U 0.11–0.48, 7 analyses, 5% filter), while the oscillatory rims are younger 143.7±1.1 Ma (MSWD=1.5, Th/U 0.30–0.51, 10 analyses, 5% filter) (Fig. 1b). Zircon grains from epidote-biotite schist show more complex zoning on CL images. The bright cores are surrounded by thick oscillatory zone, and the outermost envelopes are dark (Fig. 1c). A concordant age of 164.4±1.3 Ma (MSWD=2.1, Th/U 0.11–0.30, 5% filter) was calculated from

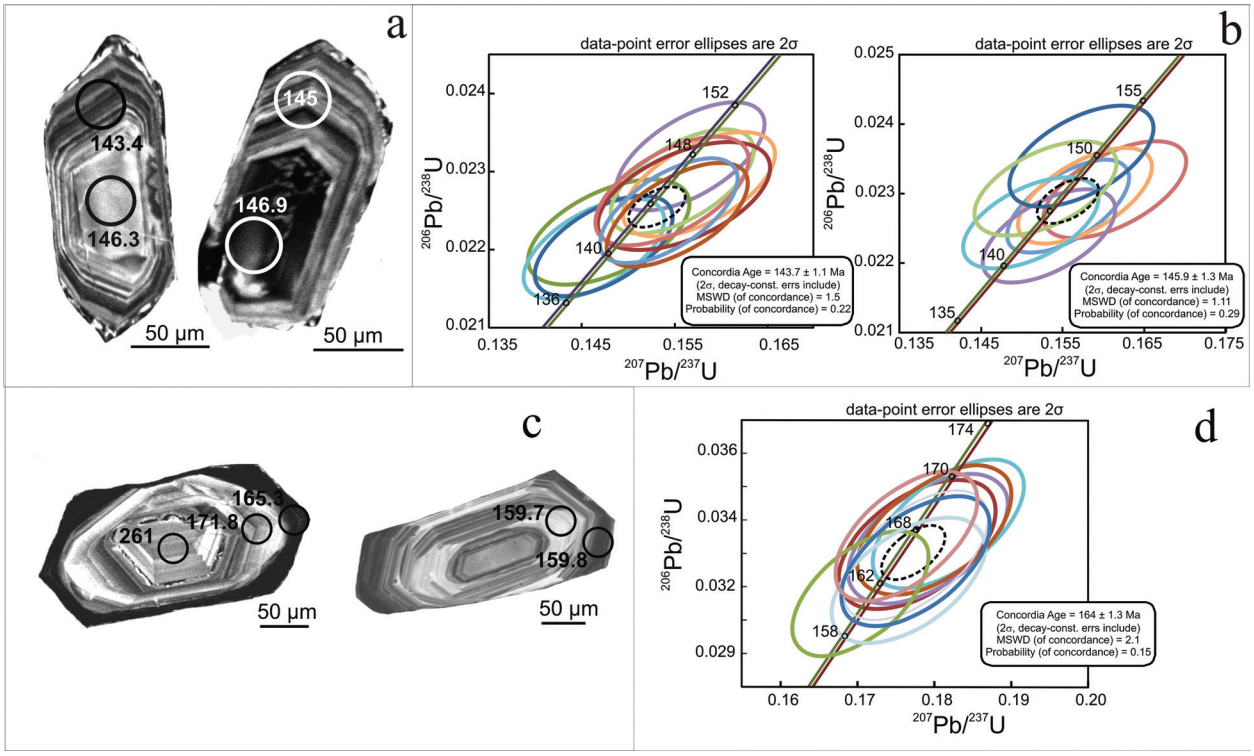

Fig. 1. *a*, CL images of selected zircon grains from garnet-staurolite schist, the circles denote the analysis spots and $^{206}Pb/^{238}U$ ages; *b*, U–Pb concordia diagram for zircon from garnet-staurolite schist, oscillatory rims – left and homogeneous cores – right; *c*, CL images of selected zircon grains from epidote-biotite schist, the circles denote the analysis spots and $^{206}Pb/^{238}U$ ages; *d*) U–Pb concordia diagram for outer dark envelopes of the zircons from the epidote-biotite schist

9 spots for the outermost dark rims of the zircons (Fig. 1d). Few grains have inherited Paleozoic cores (252–311 Ma) while the rest of the cores and oscillatory zones yield scattered Middle Jurassic ages.

Discussion and conclusions

Metaigneous Jurassic rocks are widespread in the Upper plate of the Rhodope massif (Turpaud, Reishman, 2010). Jurassic protolith age was reported for Bachkovo leptitic orthogneisses from the metaigneous part of Asenitsa unit (from 151.17±1.1 to 153.5±4.1 Ma, von Quadt et al., 2006). Our new geochronological data for the epidote-biotite schist give evidence for the presence of Jurassic metaigneous rocks with different protolith ages in the Asenitsa unit, covering a range from 151 to 164 Ma.

The source area of garnet-staurolite schist includes magmatic rock, with different, younger age, than the metagranitoids from the lower part of the Asenitsa unit. The source of material is proximal and homogeneous, and the sediment deposition may have started in Late Jurassic to Early Cretaceous. The studied detrital zircons display magmatic patterns on CL images and do not record the metamorphic event in the unit.

Although the new geochronological data do not constrain the time of metamorphism in the Asenitsa unit, it is clearly post Late Jurassic and could be coincident with the metamorphism in the Parvenets complex (77.5±3.2 Ma, Georgieva et al., 2018).

Acknowledgements: This study was supported by National Scientific Fund, project DN 14/5 2017.

References

Georgieva, M., V. Bosse, Z. Cherneva, Tz. Vladinova. 2018. Polymetamorphic evolution of Parvenets complex, Bulgaria – U-Th-Pb monazite geochronology and geochemistry. – *Rev. Bulg. Geol. Soc*., 79, 3, 49–50.

Guiraud, M., Z. Ivanov, J.-P. Burg. 1992. Découverte de schistes de haute pression dans la région de Biala Tcherkva (Rhodope Central, Bulgarie). – *C. R. Acad. Sci. Paris*, *315*, 2, 1695–1702.

Sarov, S. 2012. Lithotectonic subdivision of the metamorphic rocks in the area of Rila and Rhodope Mountains – results from geological mapping at scale 1:50000. – In: *International conference "The school of Prof. Z. Ivanov"*. Sofia, National Museum "Earth and Man", 43–47.

Turpaud, Ph., T. Reischmann. 2010. Characterisation of igneous terranes by zircon dating: Implications for UHP occurrences and suture identification in the Central Rhodope, northern Greece. – *Int. J. Earth Sci.*, 99, 567–591.

von Quadt, A., S. Sarov, I. Peytcheva, E. Voynova, N. Petrov, K. Nedkova, K. Naydenov. 2006. Metamorphic rocks from northern parts of Central Rhodopes – conventional and in situ U-Pb zircon dating, isotope tracing and correlations. – In: *Proceedings of the National Conference "GEOSCIENCE 2006"*. Sofia, BGS, 225–228.