The isotopic composition of carbon and oxygen of calcite of veinlets and enclosing rocks within the limits of the Lopushna oil field (Ukrainian Carpathians)

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We have quoted the results of the isotopic composition research of carbon and oxygen from calcite of veinlets and enclosing rocks within the limits of the Lopushna oil field the oil deposits of which are confined to the platform sediments of Paleogene, Cretaceous and Jurassic overlapped by overthrust of the Carpathians [1].

The isotopic analysis has revealed sufficiently homogenous values both of $\delta^{13}C$, correspondingly, -2.3÷+2.5 and -0.1÷+3.8 ‰ (standard PDB), and $\delta^{18}O$ – 22.2÷27.7 and 23.4÷30.5 ‰ (standard SMOW) that are not correlated with a depth of occurrence and a spatial distribution of a veinlet, the composition and the age of the enclosing rocks etc. It is established too that carbon from veinlet's calcite is always a little more heavy (enriched by isotope ^{13}C) comparatively with carbon of calcite of enclosing rocks, but oxygen, on the contrary, too light (impoverished by isotope ^{18}O).

This testifies to the influx of mineral forming fluids through thick systems of fractures due to vertical migration processes [2]. Moreover, data reached have confirmed the one-act character of the entrance of the hydrocarbon-containing fluids at an interval between the Middle and Late Pliocene [3] caused by tectonic activization that promoted the region's reconstructing and regenerating old and, correspondingly, opening new paths for penetration of fluids. Then traps with the formation of deposits of the oil in rocks of different age were filled with their hydrocarbon component. Healing of fractures by the mineral substance of deep-seated high-temperature fluids with the formation of the calcite veins and veinlets probable occurred from the single homogenized source [4].

[1] *Atlas of oil & gas fields of Ukraine* (1998). [2] Svoren' & Naumko (2006) *Rep. of the NAS of Ukraine* **2**, 111–116. [3] Ladyzhenskyi (1961) *Geol. Collect. Lvov. Geol. Society* **7/8**, 79–88. [4] Naumko (2006) Doctoral thesis, p.52.

Importance of porosity in saprolite formation on basalt

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Weathering of rock to saprolite plays an important role in sustaining terrestrial ecosystems. Rock weathering induces mineralogical and structural changes that release nutrients and increase the ability of the rock to retain water for uptake by microbial and plant life. Despite the importance of this process we are currently unable to predict how fast rock weathers to form saprolite, in part due to a widely observed discrepancy in weathering rates with scale. Studying weathering at scales intermediate to watershed and laboratory will help elucidate controlling processes in natural weathering systems and provide better understanding of scaling of weathering rates.

This study examines in great detail the processes that control how fast rock weathers to saprolite on basalt clasts with weathering rinds. These basalts have been weathering for 35 to 250 ka in an environment protected from physical erosion. The parent basalt (~67% plagioclase and 27% augite) weathers to form a rind of gibbsite and iron oxide. Detailed analyses of the reaction front between the weathering rind and parent core show complete dissolution of plagioclase and augite and an increase in porosity from <3% to > 25% across a 1-2 mm wide zone. Numerical reactive transport models show that understanding the porosity increase is a critical component of predicting rates of saprolite formation. In fact, once porosity generation is accurately described, we are able to predict the growth of weathering rinds on these clasts over hundreds of thousand of years using laboratory derived dissolution rates.