Svidnya plot in two separate time intervals: 315 – 305 Ma and 455 – 440 Ma (ID – TMS). Surprisingly LA – ICP-MS show considerable scattering, as the results cover very large time span: 840 – 388 Ma. Both ID – TIMS and LA – ICP-MS for dyke rocks from Svidnya plot mainly in the interval 460 – 450 Ma. Perfectly concordant ID – TIMS ages for the intrusive rocks from Shipka delineate two intervals: 555-506 Ma and 303 Ma. LA – ICP-MS determinations are grouped in several narrow intervals: 345-335 Ma, 319-326 Ma and 309-307 Ma. At the same time LA – ICP-MS data for dykes from the pluton show much older age: 462-454 Ma.

Ages as 450 Ma could not indicate the time of intrusion of plutonic rocks, because such ages are older than the host metasediments (Ordovician, Silurian and Devonian). Thus, Variscan ages in the interval 350 - 303 Ma would represent the time of formation of the potassic-alkaline rocks. This time interval is too large and it is not possible to determine precisely the position of these rocks in the frame of the Variscan orogeny. Very striking feature is the ubiquitous presence of inherited cores in the studied zircons. It was to some extent unexpected, because zircons are highly soluble in hydrous and peralkaline magmas (according to the experimental data). The fact, that were found complex zircons with strong inheritance even in most alkaline rocks is surprising and requires more attention.

Up to now rest unclear the relationships between the potassic rocks and the calc-alkaline granitoids, as well as the successiveness of magma formation. The results show that both rock types are generally contemporaneous, so they belong to one tectonic event. The marked differences in their composition should be attributed to the sources.

The zircons show a multistage origin, attesting for overlapping variable geological events. The frequent presence of inherited cores in the zircon testifies for multiple recycling of older material, involved in the generation of the potassic magmas. At this moment we are not able to specify the nature, origin and mechanism of involvement of these older materials in the source. The results show that material segregation from source and crystallization histories of the magmas were very complex.

## Underground geotouristic routes in the Małopolska District

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In the Małopolska District two underground routes located in old mine workings have been opened to the public. They were developed in the Forecarpathian Basin, in the salt mines in Wieliczka and Bochnia. The salt deposits are hosted in Tertiary - Miocene formations accompanied by anhydrites, gypsum and clays. From the south, these formations are surrounded by the sandstones and shales (flysch), which belong to the Carpathian Foredeep. In both the salt mines in the tourists visit the old mine workings, mainly in the form of spacious chambers and galleries. In those mines the visitors experience a small boat trip across the underground sweet lakes. In Bochnia's salt mine visitors are also carried by the historical underground railway along 1km distance. Those salt mines are very popular underground health resorts. People ill of breathing system can spend there some time for inhalation.

## Micas and clay minerals of muddy to clayey sediments from the Paleogene variegated shales, Polish Carpathians

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The research was carried out on shales and mudstones of the Hieroglyphic Beds in the eastern part of the Dukla Unit. Samples of shales and mudstones were examined using optical microscopy, X-ray powder diffraction (XRD) and scanning electron microscopy (SEM). The

chemical composition of minerals was studied by energy dispersive spectrometry (EDS). In order to obtain clay fractions of <2 µm and <0.2 µm the samples were prepared according to the standard Jackson method. Clay minerals preparations were air-dried, glycol vapour saturated and heated at 330ºC and 550ºC.

Muscovite is the most common detrital mineral and the main component of the analyzed sediments. It occurs as mangled flakes, which underline the lamination of the host rocks. The EDS analyses have revealed fengite character of muscovites, which contain up 5.27 wt% of the $Fe_2O_3$. Biotite grains in most cases underwent chloritisation.

The XRD analyses of the <2 µm have revealed the presents of illite, chlorite and mixed-layer minerals: illite/smectite and chlorite/smectite. Illite, in most cases, is the component of cement. Detailed characterization of illite/smectite was based on the diffractograms of the (0.2 µm fraction obtain from the XRD studies of glycol vapour saturated oriented preparation. The type of layer ordering in the mixed layered minerals was established according to the position of 001 reflection. R1 and R>1 are the characteristic types of the ordering in these minerals. They contain up to 30% of smectitic component in their structure. The presence of 1M and 2M1 politypes confirms the existence of both authigenic and detrital illite in the analysed clay material. The EDS investigation showed different amounts of Fe (from 5 to 30 wt% of $Fe_2O_3$) in illite or illite/smectite mixed layers.

It was determined that only detrital chlorites appear in the studied sediments. They are often products of chloritisation of biotite. The XRD studies of the <2µm fraction displayed presence of chlorite and mixed-layer chlorite/smectite. It was confirmed during the EDS examinations, which revealed a considerable amount of K, which may derive from smectitic layers. Moreover, the EDS studies showed that chemical composition of chlorites varies considerably and that it is comparable to the composition of chamosite and ripidolite.

The chemical composition of minerals occurring in the studied rocks indicates the complex diagenetic environment. The composition of the pelitic fraction (illite, illite/smectite, chlorite and chlorite/smectite) and a small amount of smectitic component in the ordered illite/smectite interstratifications (R1 and R>1) in particular, indicate the advanced degree of diagenesis.

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## Environmental impact of Pt, Pd, Rh and Au from catalytic converters along roadsides: The case of Attica, Greece

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Platinum (Pt), palladium (Pd), rhodium (Rh) and gold (Au) were investigated along high-ways of Attica, Greece, with varying traffic, like Katehaki, Messoghion, the intersection between Katehaki, Messoghion and Acharnon avenues, and residential roads, like Pindos and Navarinou roads. Platinum ranges between 110 and 960 ppb in dust samples and from 44 to 820 ppb in soils, Pd ranges between 90 and 1300 ppb in dust samples and from 36 to 1100 ppb in soils. The analysis of dust collected from parts of the roadsides closed to water sewerages reached as high as 2070 ppb Pt and 1980 ppb Pd contents. Gold ranges from 14 to 990 ppb Au (average 230) in dust samples and from 27 to 160 ppb Au (average 95) in soil ones. Any relationship between Au and Pt or Pd is not obvious. The significant fraction of the traffic-related emissions, reaching values over 4 ppm (Pt+Pd), suggest that they may be concentrated into local water systems resulting an environmental risk. Palladium was the most abundant PGE in the grasses ranging from 0.6 to 23 ppb (average 6.8 ppb), Pt ranges between 2.3 and 6.6 ppb (average 4.2 ppb) while Rh is < 0.1 ppb. Average values of the Pd/(Pd+Pt+Rh), Pt/(Pd+Pt+Rh) and Rh/Pd/(Pd+Pt+Rh) ratios decrease from 0.62 to 0.33 and 0.05 respectively, suggesting the Pd>Pt>Rh bioavailability order.