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USE OF MICACEOUS FORMATIONS DURING FORECASTING-PROSPECTING WORKS ON DIAMONDS

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Results of complex investigation of crusts of weathering on various rocks in diamondiferous regions of the Siberian platform are given and their concentration in productive Upper Palaeozoic and Mesozoic sedimentary terrains of the same territory is determined. Special attention is paid to micaceous formations, for which their typomorphic features in eluvium in various by mineralogical and petrographic composition rocks are established. Comparative analysis of reviewed during work crusts of weathering indicates that together with mineralogical features of source rocks and hydrogeochemical conditions of environment three following factors have great significance in forming eluvial products. The first is the degree of structural order of primary minerals. The second is connected with inheritance of these properties by newly arising phases. And the third includes universality of the process of transforming hypogene and formation of hypergene minerals in the profiles of weathering developed on various types of rocks. Thus successful use of these formulated complementary provisions for objective revelation of regularities of zonal structure of crusts of weathering can be based only on their complex optical-electronic-microscopic and structural-crystallochemical investigation. The established typomorphic features of micaceous rocks, typical of hypergenely altered micaceous rocks, can be successfully employed during forecasting-prospecting works on diamonds, in particular for refinement of ablation sources of local material during palaeogeographic reconstructions of various terrains of Upper Palaeozoic and Mesozoic ages.

Key words: crust of weathering, mica, typomorphic features, hypergenesis, daimond-bearing territories, Upper Palaeozoic, Mesozoic, Siberian platform.

Productive sedimentary terrains, which are potentially diamondiferous, and through which prospecting of primary sources of diamonds are performed, often contain micaceous formations. As our studies of such Upper Palaeozoic and Mesozoic sedimentary terrains of basic diamondiferous regions of the Siberian platform have shown, ancient crusts of weathering on various rocks served as sources of such micaceous rocks. In recent years forecasting-prospecting works on diamonds have been developing on new distribution areas of Upper Palaeozoic and Mesozoic depositions and first of all – in Malo-Botuobinsky, Daldyn-Alakit, Sredne-Markhinsky and Markoka diamondiferous regions located, accordingly in south-eastern, central and north-eastern parts of the eastern border of Tungusskaya syneclise and in north-east of Angara–Vilyui sagging. With the purpose of ascertainment of conditions of fluid wash and redeposition of products of weathering of ancient crusts of weathering in productive terrains complex investigation of material composition of eluvium on various rocks was performed in recent years, as well as studies of Upper Palaeozoic and Mesozoic sedimentary complexes of one of the

major diamondiferous regions – Malo-Botuobinsky, located in the centre of Yakutian kimberlitic province.

In the section of Upper Palaeozoic depositions of Malo-Botuobinsky diamondiferous region continental Upper Carboniferous–Lower Permian formations of Lapchanskian, Botuobinskaya and Boruloyskian suites [12] are distinguished. *Lapchanskian suite* (down to 20–25 m) is represented by dark-grey clays and siltstones with interlayers of sand. In lower part it is composed mainly by redeposition products of Upper Devonian–Lower Carboniferous crusts of weathering, and sometimes by interlayers (lenticles) of gritstones, pebblestones and breccias with up to 0,8 m thickness. *Botuobinskaya suite* (60–70 m) occurs with attributes of fluid wash on Lapchanskian suite or on eroded surface of rocks of Lower Palaeozoic. Two members are distinguished within it. The lower one (50–55 m) is composed by greenish-grey fine-, average-, seldom coarse-grained sand, higher – by dark-grey solid clays, siltstones with interlayers of fine-grained sands and carbonaceous-argillaceous formations. Upper member (10–12 m) is represented by greenish-grey fine-grained sands and siltstones. *Boruloyskian suite* (90–100 m) with fluid wash overlaps various horizons of Botuobinskaya suites and rocks of Lower Palaeozoic. It is also divided into lower (50–65 m) and upper (up to 35 m) members. Lower parts of the section (10–15 m) are formed by greenish-and yellowish-grey average-, large-grained sands with basal gritstones and pebblestones with thickness up to 2 m. Higher up clay, siltstones with thin interlayers of coals develop, on which with fluid wash a pack (30–40 m) of yellowish-grey average-, fine-grained sands occurs. The upper part of lower member is represented by dark-grey siltstones, solid clays and carbonaceous formations. The upper member it is composed by whitish fine-and average-grained sands.

Mesozoic depositions in Malo-Botuobinsky region are represented by continental deposits of Irelyakhskian and Ukugutskian suites, and also by coastal and marine formations of Pliensbachian and Toarcian stages [13]. *Irelyakhskian depositions* were formed at the beginning of powerful Mesozoic stage of sedimentation in western part of the Vilyuy syneclise and by them history of foundation and development of these structures [1] is usually restored. These formations preserved from wash-out in the form of outliers in central part of Angara-Vilyui sagging and on its borders. They crop along M. Botuobiya River and also are exposed in its headwaters. Most complete sections of the suite are investigated in depressions of Pre-Irelyakhskian relief. They are composed by argillaceous siltstones, sandy-siltstone clays with interlayers of sand and lenticles of gritstones, pebblestones, carbonaceous clays and brown coal. Frequently they are typical lake and lake-marsh sediments with abundance of authigenous pyrite and siderite. Sometimes alluvial depositions are observed - sands, less often pebblestones. Their colour is basically grey, greenish-brown, and less often brown. Poorly sorted rocks (predominantly proluvium-dealluvial facies), consisting of greatly weathered fragments of dolerites, gravel and shingle of quartz-siliceous rocks consolidated by argillaceous material dominate in the north of the region within the limits of trap plateau, in Irelyakhskian section. Irelyakhskian suite occurs on the eroded surface of terrigenous-carbonate rocks of the lower Palaeozoic, formations of trap structure of Permian–Triassic and with washout is overlapped by depositions of Ukugutskian suite. Late Triassic–Early Jurassic age of the suite is established by definitions of flora, spore-pollen complexes and position in the section. Depositions of *Ukugutskian suite* are widely developed in Malo-Botuobinsky region. Their complete sections are established in headwaters of r. M. Botuobiya and gravitate to paraxial, most drawn down part of Angara–Vilyui imposed Mesozoic sag-

ging. They occur with fluid wash on terrigenous-carbonate rocks of Lower Palaeozoic or clastic depositions of Irelyakhskian suite, sometimes on rocks of trap formation, and represent the terrain of alluvial sediments divided into three members. The lower one (30–35 m, sometimes to 50–70 m) is composed by pebblestones and inequigranular (more often coarse- and average-grained sands of grey, dark-grey and yellowish-grey colouring with rare and thin (up to 1 m) interlayers of silts and sandy clays. The mean member (25–35 m, up to 55 m in some sites) is represented by inequigranular, predominantly average-grained, cross-bedded, grey-coloured sands with admixture of gravel-pebble material and thin lenticles of pebblestones gravitating to lower part of the section. There are interlayers of brownish-grey silts, clay and lenticles of coal (2–4 cm). The upper member (20–30 m) preserved from washout in central parts of consedimentation depressions and is composed by grey-coloured thin-layered siltstones, clays, fine- and thin-grained sands. The age of Ukugutskian suite is determined by the results of multiple palynological analyses, and also on the basis of the fact that it occurs on floristically characterized depositions of Irelyakhskian suite of Rhaetian–Hettangian and is overlapped by coastal formations containing fauna and microfauna of Pliensbachian, as Early Lias–beginning of Middle Lias. *Pliensbachian depositions* in Malo-Botuobinsky region are represented by Carikskian and Domerian substages and composed predominantly by continental deposits. Basal layer composed by pebblestones, conglomerates and coarse sand is observed in the basis of Carikskian sublevel (30–50 m) depositions. Higher up grey and greenish-grey sands with interlayers of clay and siltstones, and also lenticles of solid calcareous sandstones occur. The top of the section is composed by siltstones and clay with interlayers of coals. Composition of this sublevel's depositions is rather sustained in area. Siltstones and clays prevail in Mesozoic depressions. In south-eastern half of the region Carikskian rocks with fluid wash occur on depositions of the upper member of Ukugutskian suite, and in north-western – on tuffaceous terrain of Lower Triassic, rocks of Palaeozoic and traps. In the basis of Domerian sublevel (up to 50 m) basal layer of pebblestones, conglomerates, and coarse sands is also observed everywhere, reaching sometimes significant thickness (up to 5 m), though in depressions it is expressed gently. The member of well-sorted sandstones occur higher, often with pebble and vegetative detritus. The top of the section is usually composed by fine-grained sands, silts and clays. In depressions the deposits become noticeably more granulated and are replaced by argillaceous siltstones. At raised outliers of dolerites with abrupt declines availability of thick (up to 13 m) terrain of boulders and shingles, consisting of the same dolerites, is typical. Along the ancient shore line terrain of well-sorted beach sands is noted. In a distance from this line the content of local rocks sharply decreases and exotic pebble prevails in psephitic debris of Domerian sublevel basal horizon. *Toarcian depositions* are represented by dark-grey or dark-brown argillaceous siltstones and clays, often calcareous, sometimes silty with lenticles and interlayers of calp containing abundant fauna (pelecypods, belemnites, etc.) and microfauna (various types of foraminifers and ostracods). By lithological features these depositions are divided into two members: lower (up to 45 m) – silty-argillaceous (in places with thin interlayers of fine-grained silty sands in lower parts of the section) and upper (up to 20 m) – sandy-siltstone, allocated on emersion of coarse-grained silts in the section, gently sandy in places. In the top of the upper member interlayers of grey-coloured calcareous sands and sandstones are sometimes noted. Between rocks and members gradual transitions are observed. The upper member is represented by sediments of the regressing sea.

Favourable conditions for forming thick crusts of weathering on the Siberian platform and, in particular, in Malo-Botuobinsky and Daldyn-Alakit regions, existed in Late-Devonian–Early Carboniferous and Middle–Late Triassic time. Within the limits of the Yakutian diamondiferous province ancient crusts of weathering are developed on various rocks: terrigenous-carbonate rocks of Lower Palaeozoic, dolerites, tuffs and tuff breccias of pipe-like bodies, tuffaceous rocks of Korvunchanskian suite and kimberlites [7, 14]. In structural plan ancient crusts of weathering are attributed predominantly to consedimentation paleouplifts, within the limits of which during formation of overlapping them depositions situations of denudation and denudation-accumulative plains developed. In consedimentation paleodepressions, which served as accumulation places of redeposited material of crusts of weathering, on the contrary, there were unfavourable conditions for intensive crust formation. Probably only initial stages of rocks' decomposition of substratum rocks took place here. Thus, in Late Devonian–Early Carboniferous time relatively complete and thick (up to 15 m) areal residual crusts of weathering on terrigenous-carbonate rocks of Lower Palaeozoic developed in Malo-Botuobinsky region on Ulu-Toginsky, Mirny, Dzhunkunsky and Chernyshevsky paleouplifts framing Kyuelyakhsky, Ulakhan-Botuobinsky and Akhtarandinsky depressions. In individual sections therewith upper levels of crusts of weathering are established, testifying about formation of full profiles in them. Similar paleogeomorphological features of development and distribution are typical of Middle–Late Triassic crusts of weathering as well. Judging by created maps the structures were formed in two various structurally-formation zones within the limits of Malo-Botuobinsky region in Mesozoic time, sharply differing by conditions of development and preservation of Pre-Jurassic crusts of weathering. One of them embraces all north-western half of the region territory and in the structural relation coincides with north-western border of Angara–Vilyui Mesozoic imposed sagging, being for a long time (Norian–Early Lias) denudational, and only in Pliensbachian – denudation-accumulative surface. Here Upper Palaeozoic volcanogenic-terrigenous depositions as well as rocks of trap formation (dolerites and tuffs) of Lower Triassic have been developed by the time of crust formation. Only in the band of about 25–30 km width along the edge of north-western border of the same sagging terrigenous-carbonate rocks of Lower Palaeozoic exposed at that time. Here in Middle–Late Triassic time, judging by preserved sections of the complete profile of laterite-like crusts of weathering [3], favourable conditions for intensive crust formation existed. Such profiles have been investigated by us [6, 17] on terrigenous-carbonate rocks of Lower Palaeozoic with up to 15 m thickness (right bank of r. Malaya Botuobiya undercurrent), on traps of Lower Triassic with up to 43,5 m thickness (Khatat-Ulegirsky interfluve), on kimberlites with up to 15 m thickness (pipe named after XXIII Congress of CPSU). The second – south-eastern zone of the region concurrent with central part of Angara–Vilyui sagging was unfavourable for intensive crust formation. Here terrigenous-carbonate rocks of Lower Palaeozoic exposed in Middle and Late Triassic. During crust formation the destroyed material of rocks substratum was transported to declined sites of the central part of the sagging. Synchronism of these processes is emphasized by absence of crusts of weathering under argillaceous sediments of Irelyakhskian suite with thickness up to 60 m, preserved from washout in shallow depressions. Perhaps on small uplifts in the sagging the crust of weathering could reach significant thickness.

Carried out by us earlier studies show [18], that there are essential differences in composition of weathering products on various types of rocks in analyzed region. Their vari-

ous concentrations into overlapping crusts of weathering of Upper Palaeozoic and Mesozoic depositions [8, 11] are established. Thus, the highest content (in comparison with other terrains of Upper Palaeozoic) of pebbles of acidic effusive rocks, limestones, calcareous sandstones, dolomites, marls is noted in basal horizons of *Lapchanskian suite*, that points to dominating role of local material during their formation. Lapchanskian suite differs by somewhat depleted complex of terrigenous minerals and the highest concentrations of authigenous minerals. Detrital kaolinite and dioctahedral hydromica $2M_1$ usually prevail in argillaceous fractions. The quantity and composition of psephytic material, mineral paragenesis of light, heavy and argillaceous fractions allow to state about dominating influence of redeposition products of the crust of weathering of Lower Palaeozoic terrigenous-carbonate rocks and about much smaller influence of basic and ultrabasic composition weathered rocks during formation of Lapchanskian suite. Unlike this, increased (up to 60 % and more) amount of quartzite pebbles is noted in psephytic complex of *Botuobinsky suite*. As well as with Lapchanskian suite clear regularity in distribution of basic groups of minerals of light, heavy and argillaceous fractions is not revealed in basal horizons of Botuobinsky suite, which points to non-uniform redepositions of the material from ancient crusts of weathering. In lower parts of Botuobinsky suite sections concentration of detrital montmorillonite, disordered montmorillonite–hydromicaceous and vermiculite–montmorillonite mixed-layered formations increases, which testifies about augmentation of weathering products proportion of basic and ultrabasic rocks and about sharp decrease of terrigenous-carbonate rocks' share here. In psephytic rocks of *Boruloyskian suite* the quantity of quartz fragments somewhat increases. The basic difference of this suite from underlying Permian–Carboniferous terrains is reduced to wide availability of biotite, muscovite and lepidomelane in light and heavy fractions. Montmorillonite and disordered montmorillonite-hydromicaceous mixed-layered rocks prevail in pelitic part, and kaolinite also prevails in permeable rocks (sandstones and siltstones) of flood-plain and lake-marsh facies. Analysis of mineral composition of Boruloyskian suite allows talking about great influence of weathering products of Middle Palaeozoic age basic rocks during its formation and about the subordinate role of Lower Palaeozoic terrigenous-carbonate rocks, which were overlapped by deposits of Lapchanskian and Botuobinsky suites to a significant degree by then.

Specific features of concentration of redeposition products of various crusts of weathering types in many respects are determined by tectonic position of investigated sections within the limits of noted above two structural-formation zones [2]. In conditions of low-lying alluvial plain of south-eastern zone (for Irelyakhskian and Ukugutskian suites) depositions, enriched predominantly by alien to the region polymineral material, collected. In the second (north-western) zone concurrent with north-western border of Angara–Vilyui sagging and located within the limits of trap plateau, there were conditions of denudation and denudation-accumulative plain, favourable for accumulation of sediments, in which local material prevails. At the same time sources of kimberlite material were exposing to surface along the edge of north-western border of the sagging within the limits of Malo-Botuobinsky region. Analysis of mineral composition of light and heavy fractions and their distribution on the area indicates [10], that on the whole a complex of rock-forming and accessory minerals similar with Upper Palaeozoic rocks is developed in *Irelyakhskian suite*. Similarity of morphological shape of minerals and results of lithologic-paleogeographic reconstructions allow to draw a conclusion, that the rocks of Lower and Upper Palaeozoic, widely developed in the region and on the adjoining

areas, were the basic sources of these minerals' inflow into sedimentation basins of Irelyakhskian time. Redeposition products of crusts of weathering of terrigenous-carbonate rocks, of trap formation and kimberlites, the maximum concentration of which is noted in basal horizons and lower parts of Irelyakhskian suite of Angara-Vilyui sagging's north-western border, are clearly registered here. Products of weathering of terrigenous-carbonate rocks in Irelyakhskian suite formations of this territory are confidently identified by constant availability of kaolinite and dioctahedral hydromica $2M_1$. Their maximum concentration (up to 95 % of the pelitic component) is noted in depositions of the suite in the development field of this crust of weathering. Irelyakhskian depositions along the edge of north-western border of Angara–Vilyui sagging are characterized by non-uniform concentration of the material coming from crusts of weathering of kimberlite rocks. Various range of its transportation is noted therewith as well. This, besides various morphological habit of accessory minerals and diamonds, is confirmed by established by us availability of some secondary minerals, typical of kimberlites: Fe-Mg-chlorite, vermiculite and serpentine of polytypic modification *A* [9]. Structural-morphological features and attribution to Irelyakhskian diamondiferous placers of Malo-Botuobinsky region, generated close to primary deposits, testify about insignificant transportation of these minerals. Unlike this, depositions of *Ukugutskian suite* are characterized by small concentration of redeposition products of ancient crusts of weathering. The lower horizons of Ukugutskian suite are composed by sufficiently thick series of conglomerates [8]. Pebble material is represented in them by rather miscellaneous volcanic, metamorphic and sedimentary rocks. The overwhelming majority (up to 80–90 %) of these rocks are alien to the region. Depositions of Ukugutskian suite are more enriched by redeposition products of ancient crusts of weathering in depressions of trap plateau (north-western border of the sagging) than in the central part of the sagging, but significantly less than Irelyakhskian rocks. Data of complex investigation of material composition of Ukugutskian depositions indicate that as a whole they are poorly enriched by products of crusts of weathering. Only in local depressions of north-western border of the sagging concentration of allothigenic argillaceous minerals, related with weathering of specified rocks, increases in case of their direct occurrence on the crust of weathering of terrigenous-carbonate rocks or traps, in lower horizons. High concentration of weathering products of other rocks is not peculiar for depositions of *Pliensbachian and Toarcian stages* as a whole, which is emphasized by features of material composition of these terrains. In particular, it is emphasized by insignificant admixture of allothigenic argillaceous minerals in them. During formation of these deposits only ancient crusts of weathering of basic rocks played a small part. Availability of allothigenic montmorillonite and disordered mixed-layered formations in pelitic component, typical of these crusts of weathering, points to it.

Carried out investigations indicate [5], that formation of separate zones in sections of crusts of weathering of non-micaceous volcanic rocks of both acidic and basic composition has common features as a whole. In a profile of weathering of both types of rocks the medium zone is characterized basically by development of montmorillonite in the form of an intermediate phase, and the upper one - of rather resistant in hypergenesis zone kaolinite. Differences consist mainly in crystallochemical nature of montmorillonite, arising in discussed rocks not only on plagioclases of various basic capacities, but on hornblende as well. It determines smaller speed of transformation of synthesized in eluvium of basic rocks close to trioctahedral variety swelling mineral into kaolinite. Unlike discussed

above non-micaceous rocks of acidic composition, micaceous formations as, for example, terrigenous-carbonate deposits of Yakutian diamondiferous province [4], contain dioctahedral hydromica (b = 0,900 nm) in the form of the mixture of polytypic modifications 1M and $2M_1$ ($1M$>$2M_1$), trioctahedral chlorite (b = 0,922 nm) and serpentine (b = 0,935 nm) in the lower zone of the profile of weathering. These deposits are characterized by the development of Pre-Upper Palaeozoic and Pre-Lower Jurassic crusts of weathering on them. The source rocks have undergone the greatest transformations in the Middle–Late Triassic age weathering crust. Chlorite and serpentine completely disappear in the medium zone of the crust of weathering of the discussed rocks. Hydromica 1M (as less resistant in comparison with $2M_1$) is exposed to essential degradation as well, and transformation processes in the structure of hydromica 1M stipulate substantial growth of swelling strata quantity while hydromica $2M_1$, remains relatively stable. As the result of it montmorillonite-hydromicaceous mixed-layered formation occurs at first with less than 40 % content of swelling packages, but in the upper zone the quantity of the latter increases and becomes more than 40 %. Owing to rather low perfection of this phase structure it is rapidly subjected to destruction in the acidic environment, peculiar to the upper zone of the crust of weathering, and half-disordered in the structural relation kaolinite originates from the formed products. As the result of specified transformations the content of hydromica 1M sharply decreases towards the tops of the weathering profile, therefore dominance of polytype $2M_1$ ($2M_1$>1M) is observed here.

Micaceous rocks of the basic type, amphibole-phlogopite-plagioclase gneisses of the Siberian platform [15], in particular, contain about 50 % of the basic plagioclase, 30 % of phlogopite, 20 % of amphibole. In the lower zone of the crust of weathering they are characterized by availability of trioctahedral chlorite admixture (b = 0,920 nm) besides, and also tri-(or Mg-Fe^{2+}-) and dioctahedral (or Al-Fe^{3+}-) varieties of montmorillonite (accordingly, b = 0,920 and 0,891 nm), related in the latter case with the initial stage of phlogopite transformation in peculiar to this zone restoring situation and in a small volume with plagioclase destruction. In poorly weathered parts of the common upper zone phlogopite is converted to vermiculite (b =0,916 nm) due to development of more oxidative situation upward along the profile of weathering. Plagioclase and amphibole in these conditions are subjected to intensive dissolution and from dissolution products of the first one, as well as in the lower zone, di- (b = 0,996 nm), and of the second one – di-trioctahedral, or Mg-Fe^{3+}-montmorillonite (b = 0,906 nm) originates. Simultaneously, as the result of dioctahedral montmorillonite destruction and completely of dioctahedral parts of trioctahedral varieties of this mineral kaolinite originates, characterized by relatively ordered structure and rather high dispersion of particles. Besides, owing to partial degradation of vermiculite di-trioctahedral montmorillonite is formed, associating with it.

The investigated by us diversities of ultrabasic rocks (kimberlites belong to such ones) are represented by [16] aggregates of serpentine from layers of type A and B (b = 0,929 nm) and calcite with dispersed segregations of magnetite, and by miscellaneous pseudomorphs on olivine and by variable amount of phlogopite phenocrysts as well. In the lower zone of such rocks' crust of weathering, besides, admixture of chlorite (b = 0,920 nm), sepiolite, di-trioctahedral Mg-Fe^{3+}-montmorillonite (b = 0,905 nm) and hydromica (0,900 nm) 1M are contained, associating with montmorillonite-hydromicaceous mixed-layered formations referred in last two cases to products of partial phlogopite dioctahedrization. Consecutive increase of hydromica amount is noted in the medium zone, and serpentine is represented only by layers A. Simultaneously with this the content of both Mg-Fe-

chlorite, and close to actually Mg-variety, and also Mg-Fe^{3+}-montmorillonite sharply increases, and the swelling mineral, judging by peculiar to it comparatively narrow reflexes on radiograms, is characterized by relative perfection of structure. Mixed-layered phase in these two parts of the section is characterized by a trend to the ordered alternation of dominating–non-swelling packages with subordinates–swelling ones. In the uppermost parts of kimberlite weathering profiles, due to development in them of an oxidative situation, chlorite is not always generated, but vermiculite and reviewed higher products of its further transformations can more often be formed. Simultaneously with this some impairment of the degree of its structure perfection, as the result of the proceeding montmorillonite dioctahedrization process, takes place. Accompanying these transformations partial destruction of montmorillonite in lower parts of the upper zone stipulates relative increase of hydromica content in it. In turn, the content of non-swelling packages decreases in the structure of mixed-layered phase, in the result of which the latter in this case alternate disorderly with dominating–swelling ones. In tops of the sections small admixture of kaolinite is synthesized from destruction products of most disordered part of dioctahedral montmorillonite and mixed-layered phase.

Thus, the investigated profiles of weathering of micaceous rocks from acidic up to ultrabasic composition are also characterized by similar structure. Origination of hypergene chlorite due to fundamental – hypogene minerals (mainly, trioctahedral micas) is the specific feature of rocks' alteration in the lower zone already. In the medium zone swelling minerals have the greatest development. However, in comparison with non-micaceous rocks, they are represented by mixed-layered phase along with montmorillonite. Both of the specified minerals at this, in basic and ultrabasic rocks, are referred not only to actually dioctahedral type, but also close to trioctahedral one with progressive dioctahedrization upward along the sections of weathering profiles. It is an essential condition for originating of the most resistant in hypergene conditions stratified mineral – kaolinite from destruction products of swelling minerals in future. For products of weathering of micaceous diversities of basic rocks, as well as their non-micaceous analogues, higher content of swelling minerals is typical, unlike acidic rocks. Owing to it and due to essential trioctahedral character of a significant part of these minerals in basic rocks' profiles of weathering, they preserve for longer time, including the upper zone. In these parts of acidic rocks' profiles of weathering (terrigenous-carbonate rocks can also be referred to them) eluvium is enriched by more resistant polytype $2M_1$ in the result of faster disintegration of least perfect in the structural relation micaceous phase of polytype modification $1M$ and accordingly derivative from it montmorillonite–hydromicaceous mixed-layered phase. The cited data indicate that formation of individual zones in profiles of weathering of various types non-micaceous and micaceous rocks (from acidic to ultrabasic inclusive) is determined not only by their mineralogy and hydrogeochemistry of environment at different levels of weathering, but also by structural features of rock-forming minerals and mechanism of their transformation in the zone of hypergenesis. Dissolution of source minerals and consistently developing synthesis of definite neoformations or their associations are the most principal processes of non-micaceous rocks' alteration depending on speed of mobile members' removal from the system of mineral formation and respective alterations of the acid–base and reductive–oxidative parameters. Association from relatively more ordered, than in acidic rocks, dioctahedral montmorillonite and $CaCO_3$ is formed in crusts of weathering of non-micaceous basic rocks, which contain mainly basic plagioclases, pyroxenes, and amphiboles at early stages of hypergene process due to

dissolution at first of least resistant from specified minerals – basic plagioclases. Universal nature of this association development is emphasized by its availability in lower zones of the eluvium which has generated on dolerites of Yakutian diamondiferous province as well. Simultaneously with it close to trioctahedral variety montmorillonite originates due to disintegration products of some resistant rocks of pyroxenes and amphiboles during hypergene transformation. Unlike dioctahedral, this variety of montmorillonite is characterized by initially more perfect structure, as well as the majority of stratified silicates of trioctahedral type (especially hypogene ones). As a result of progressing Mg removal from the structure of this montmorillonite during weathering and complete acidation of Fe^{2+} consecutive dioctahedrization of its structure and homogenization from dioctahedral analogue of the discussed mineral, related with destruction the basic plagioclase, take place. Considering common orientation of crystallochemical transformations of minerals in the zone of hypergenesis, the specified process has an irreversible occurrence in this case. It should be noted at this, that kaolinite towards the tops of the section is characterized by increase of the structure perfection degree.

Unlike this, processes of transformation of different varieties of micas in micaceous rocks diversities of both acidic and basic composition, along with dissolution of reviewed above minerals, acquire great significance. Owing to layered structure minerals of micaceous type are subjected to degradation transformations during weathering and depending on di- or trioctahedral character of these minerals and peculiar to them polytype modifications the specified alterations possess definite features. One of them is availability of a gamma of various mixed-layered formations predominantly in lower and medium parts of profiles of weathering, except for arising in some cases (at applicable type of source rocks) montmorillonite proper. Thus, various stability of individual modifications of these minerals acquires the most important value for formation of eluvial products in profiles of weathering of acidic rocks (including the terrigenous-carbonate rocks developed on the Siberian platform), containing the mixture of dioctahedral micaceous minerals of polytype modifications 1*M* and $2M_1$, especially in cases of gently resistant polytype 1*M* dominance in source rocks. Already at early stages of weathering intensive removal of K takes place owing to nonuniform replacement of Si by Al in tetrahedrons of mica crystal lattice from a part of the least charged interlaminar gaps of structure 1*M*, that stipulates the development of a mixed-layered phase. In upper parts of this type weathering profiles the role of more resistant polytype $2M_1$ increases due to decrease of mixed-layered phase 1*M* (owing to its transformation into kaolinite). Development of not only various mixed-layered phases, but also of some interim individual minerals of trioctahedral type occurs at early stages of the eluvial process in crusts of weathering of the basic type micaceous rocks, which contain tetrahedral micas (mainly of biotite and phlogopite, i.e. minerals characterized predominantly by polytype modification 1*M*) along with basic plagioclases, pyroxenes and amphiboles as well. Phlogopite at this is partially converted into chlorite, at the earliest stages of source rocks transformation in alkaline environment and in sharply regenerative situation, and – into vermiculite at later stages in close to specified above environment but in an oxidative situation. Chlorite rapidly decomposes towards the sections' tops. Due to alteration of vermiculite at first vermiculite is formed, and due to the latter kaolinite is also formed. Single-type minerals, occurring both in basic and in ultrabasic diversities of rocks, are characterized by close mechanism of transformation in profiles of weathering of ultrabasic rocks (in particular of kimberlites). Basically only recrystallization of relatively high-temperature polytype modification of type *B*

serpentine into the most low-temperature – *A* is the specific feature of hypergene process in these rocks at its early stage owing to durable conservation of high-alkali environment. Due to alteration of phlogopite hydromica is formed, inheriting peculiar to the first one polytype 1*M*, which is more resistant than single-type montmorillonite-hydromicaceous mixed-layered formation.

Comparative analysis of discussed above crusts of weathering indicates, that along with mineralogical features of source rocks and hydrodynamic conditions of environment three following factors have great significance in formation of eluvial products. The first one is the degree of structural orderliness of primary minerals. The second is related with inheritance of these properties by newly emerging phases. And the third includes universality of hypogene transformation process and of hypergene minerals formation in the profiles of weathering, developed on various types of rocks. Successful use of these provisions therewith, can be based only on their complex optical-electronic-microscopic and structurally-crystallochemical investigation for objective revelation of regularities of the zoned structure of weathering crusts. The specified methodology allows to differentiate the same specific varieties of primary minerals at a structural level, and also to differentiate the secondary stratified silicates differing in the latter case, either by typical occupation of octahedral positions in their structure, i.e. by di- or trioctahedral motive of crystal lattice, or by way of mutual application of separate silicate layers in the structure of these minerals or by their polytype. In turn, established typomorphic features of micaceous rocks in crusts of weathering of kimberlites and widely developed on the Siberian platform eluvium of terrigenous-carbonate rocks can be successfully used during forecasting-prospecting works on diamonds, in particular at paleogeographic reconstructions of Upper Palaeozoic and Mesozoic terrains and determination in them of source areas into sedimentation basins of local rocks material.

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ВИКОРИСТАННЯ СЛЮДИСТИХ УТВОРЕНЬ ПІД ЧАС РОЗШУКОВО-РОЗВІДУВАЛЬНИХ РОБІТ НА АЛМАЗИ

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Наведено результати комплексного дослідження кір звітрювання на різних породах в алмазоносних районах Сибірської платформи, визначено місця їхньої концентрації у продуктивних верхньопалеозойських і мезозойських осадових товщах. Особливу увагу приділено слюдоносним утворенням, типоморфні особливості яких залежать від того, по породах якого мінерального і петрографічного складу вони сформувалися. Порівняльний аналіз досліджених кір звітрювання засвідчив, що разом з мінералогічними особливостями вихідних порід і гідротермальними умовами середовища важливе значення для формування продуктів звітрювання мають три чинники: перший – це ступінь структурного впорядкування первинних мінералів; другий пов'язаний з успадкуванням цих властивостей новоутвореними фазами; третій – це універсальність процесу перетворення гіпогенних та утворення гіпергенних мінералів у корах звітрювання, які розвиваються по різних породах. Успішне використання наведених додаткових умов для об'єктивного визначення зональної будови кір звітрювання може ґрунтуватись тільки на комплексних оптико-електронно-мікроскопічних і структурно-кристалохімічних дослідженнях. Виявлені типоморфні особливості слюдистих порід, типові для гіпергенно змінених слюдоносних утворень, можна успішно використовувати під час розшуково-розвідувальних робіт на алмази.

Ключові слова: кора звітрювання, слюди, типоморфні особливості, гіпергенез, алмазоносні території, верхній палеозой, мезозой, Сибірська платформа.

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