ROSATOM

VNIIHT

New Au-U deposit type in the weathering crust in tectonic-metasomatic zones of Pre-Cambrien shields

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New technologies create new deposits.
The ore occurrences not profitable for mining by traditional methods are becoming the industrial deposits via the new technologies.

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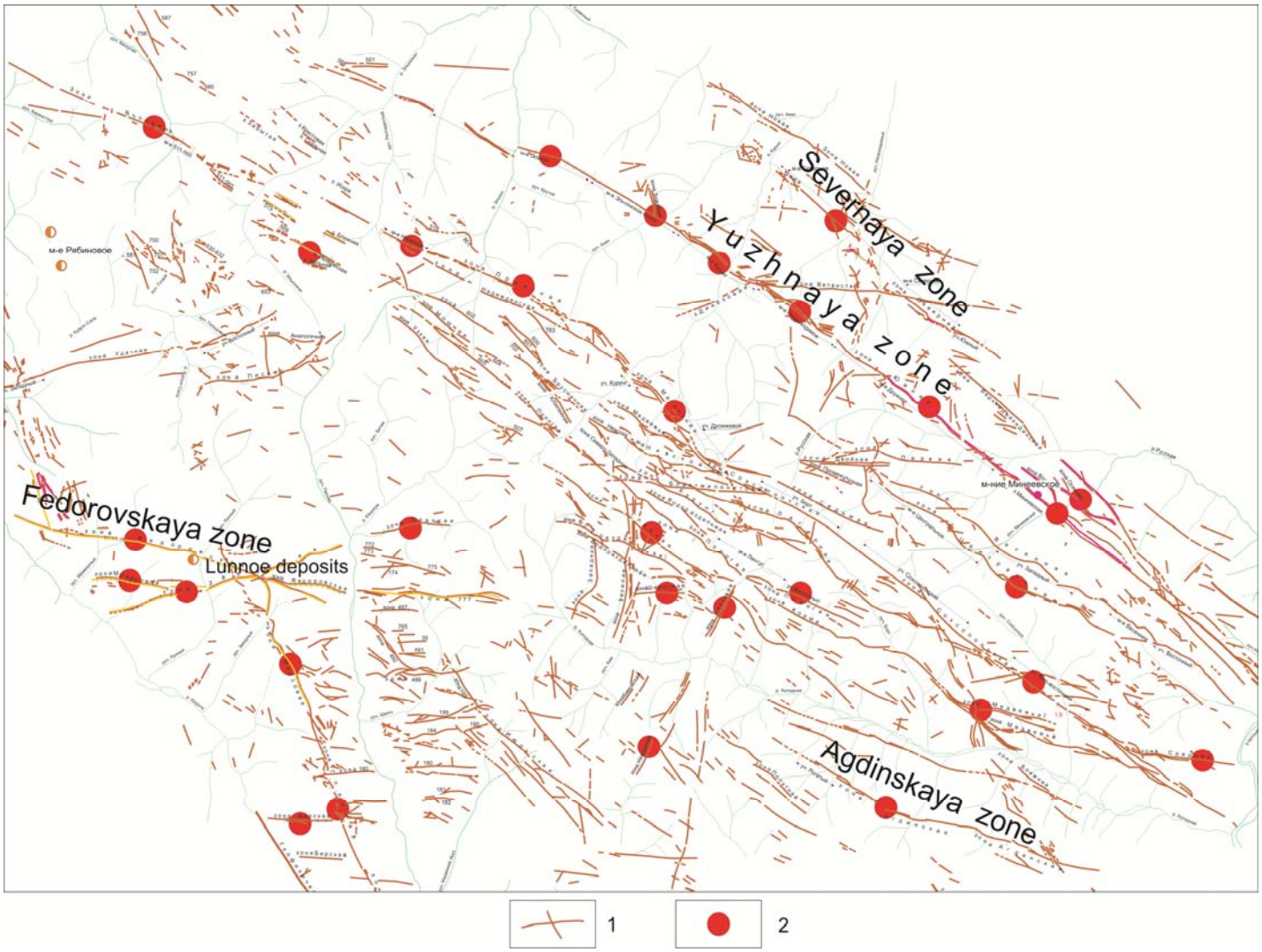
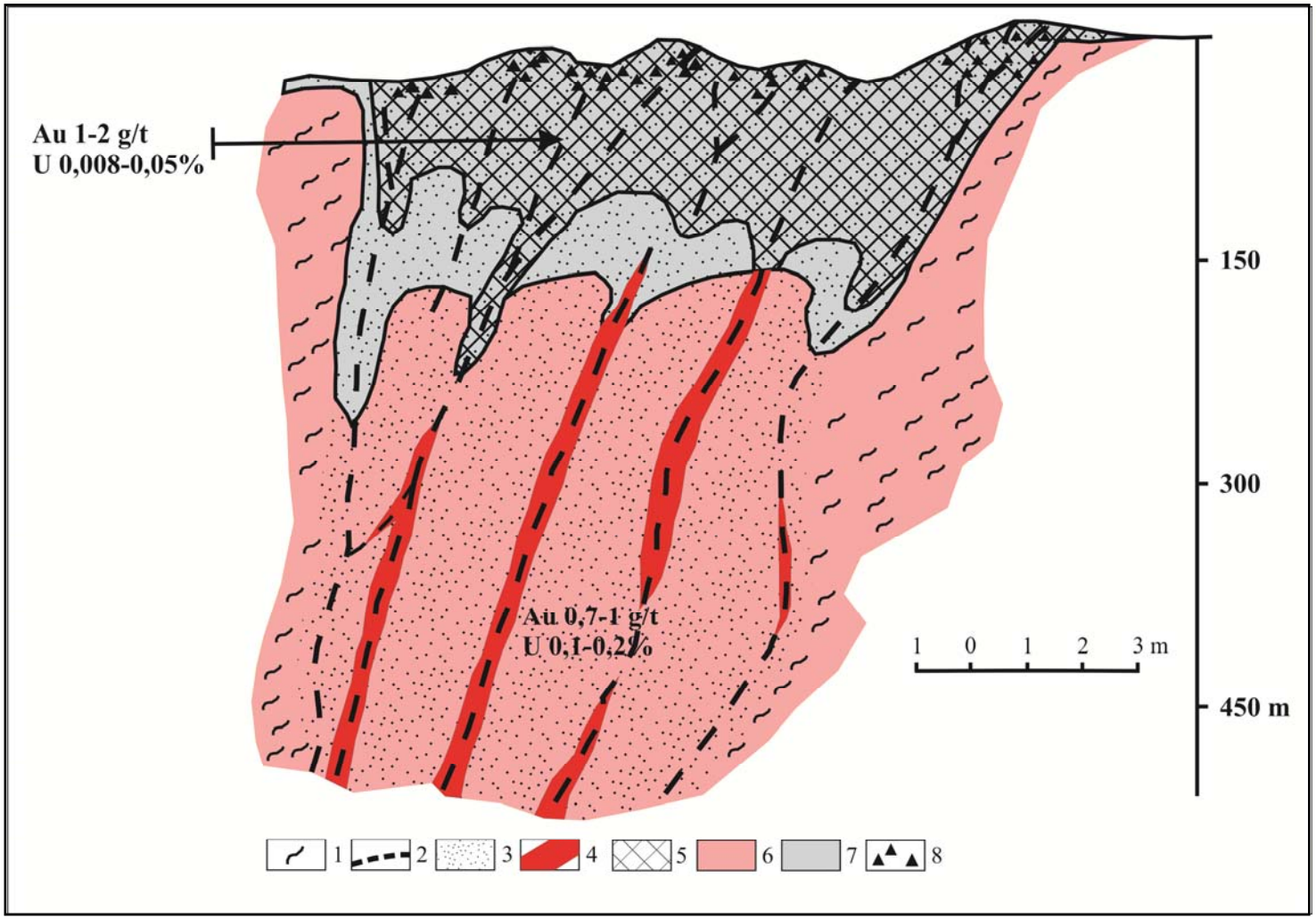
Distribution auriferous tectonic-metasomatic zones in the Elkonsky region of Aldan shields



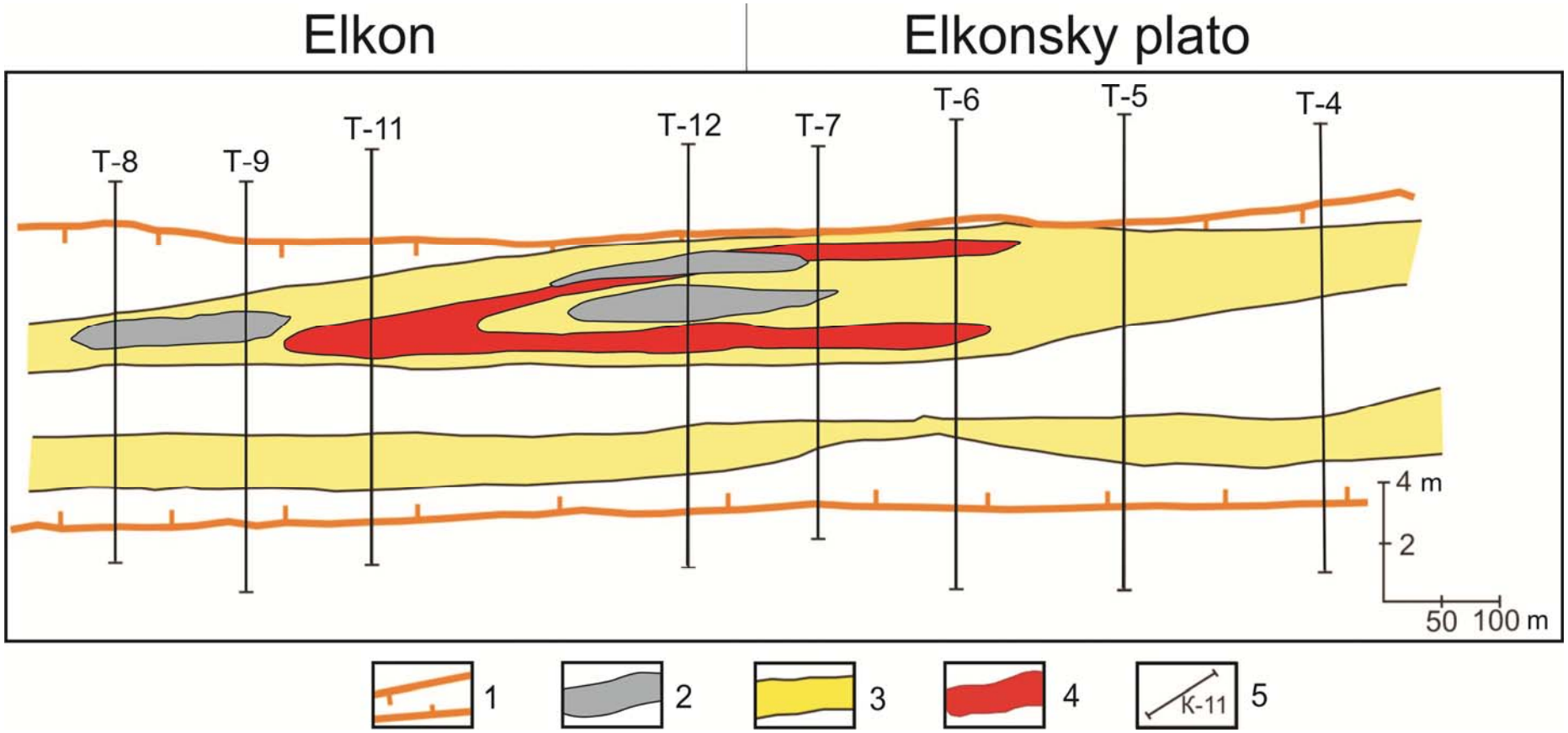
1 – tectonic-metasomatic zones; 2 – samples with gold content more 1 g/t

The schematic cross section of tectonic-metasomatic zones



1 – gneiss, granite; 2 – tectonic suture; 3 – Pyrite-Carbonate-K-feldspar metasomatite; 4 – Au-U ore bodies; 5 – U-Au ore bodies; 6 – original rock; 7 – weathering crust; 8 – disintegrated rock

The correlation gold and uranium mineralization in Yuzhnaya zona



1 – tectonic-metasomatic zone. Content of U is 0,0015-0,009%; 2 – Uranium ore. Content of U is 0,01-0,03%; 3 – content of gold is 0,4-0,9 g/t; 4 – content of gold is more 1 g/t; 5 – trench number

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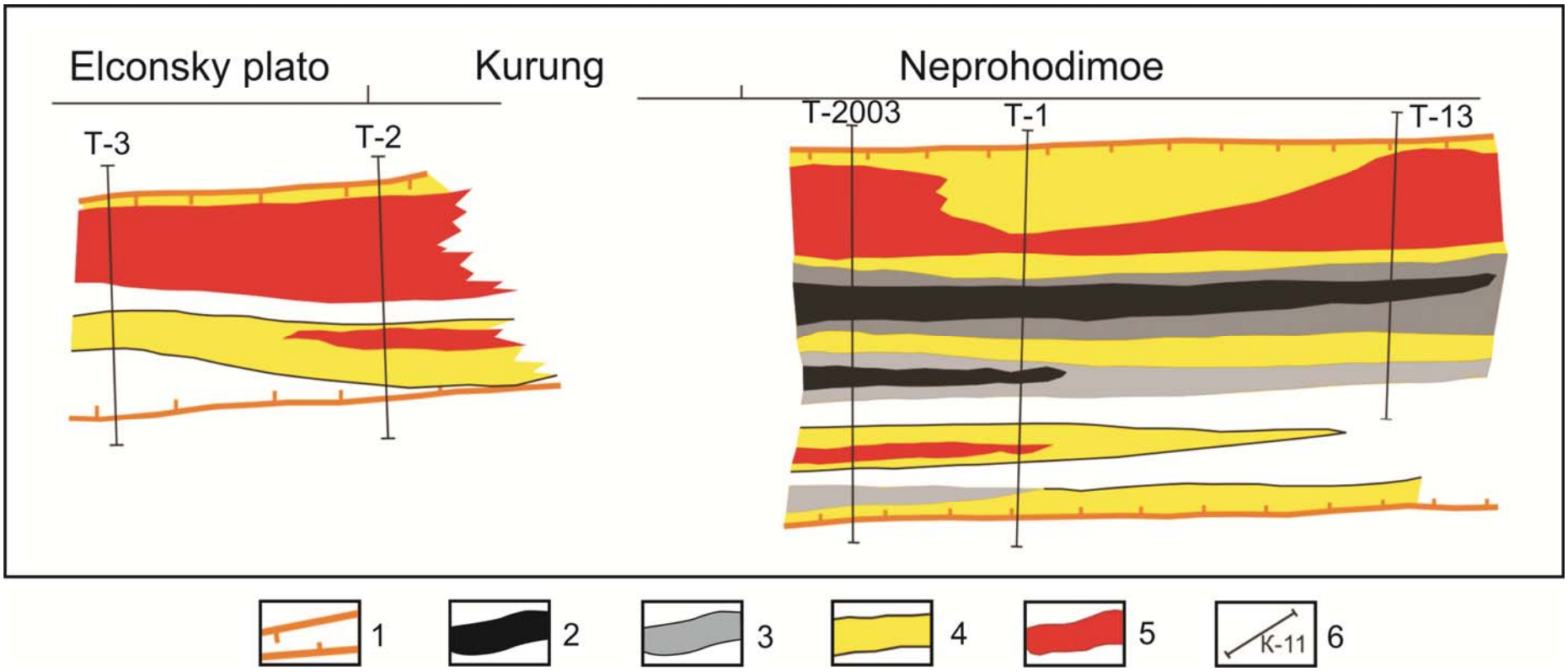
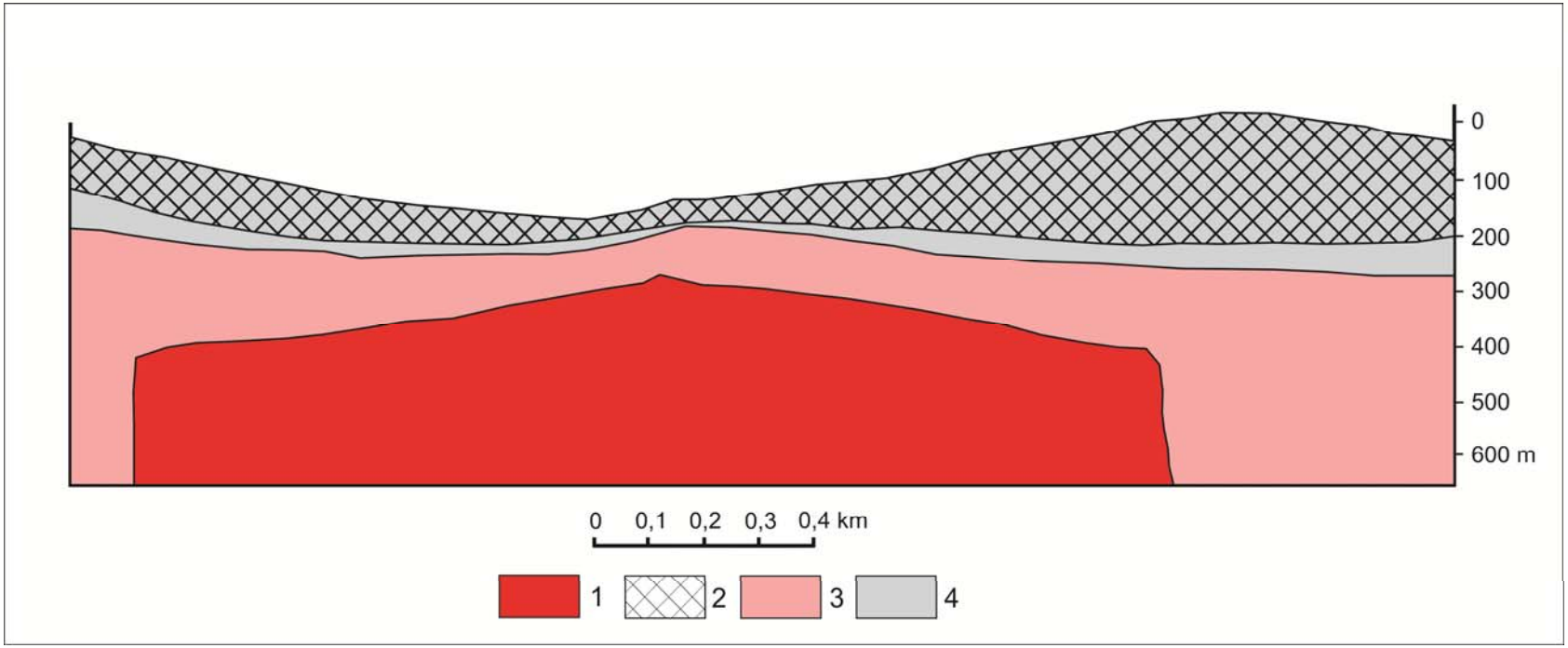


1 – tectonic-metasomatic zone. Content of U is 0,0015-0,009%; 2 – Uranium ore. Content of U is more 0,03%;

3 – Uranium ore. Content of U is 0,01-0,03%; 4 – content of gold is 0,4-0,9 g/t; 5 – content of gold is more 1 g/t;
6 – trench number

Longitudinal section of Severnaya zone

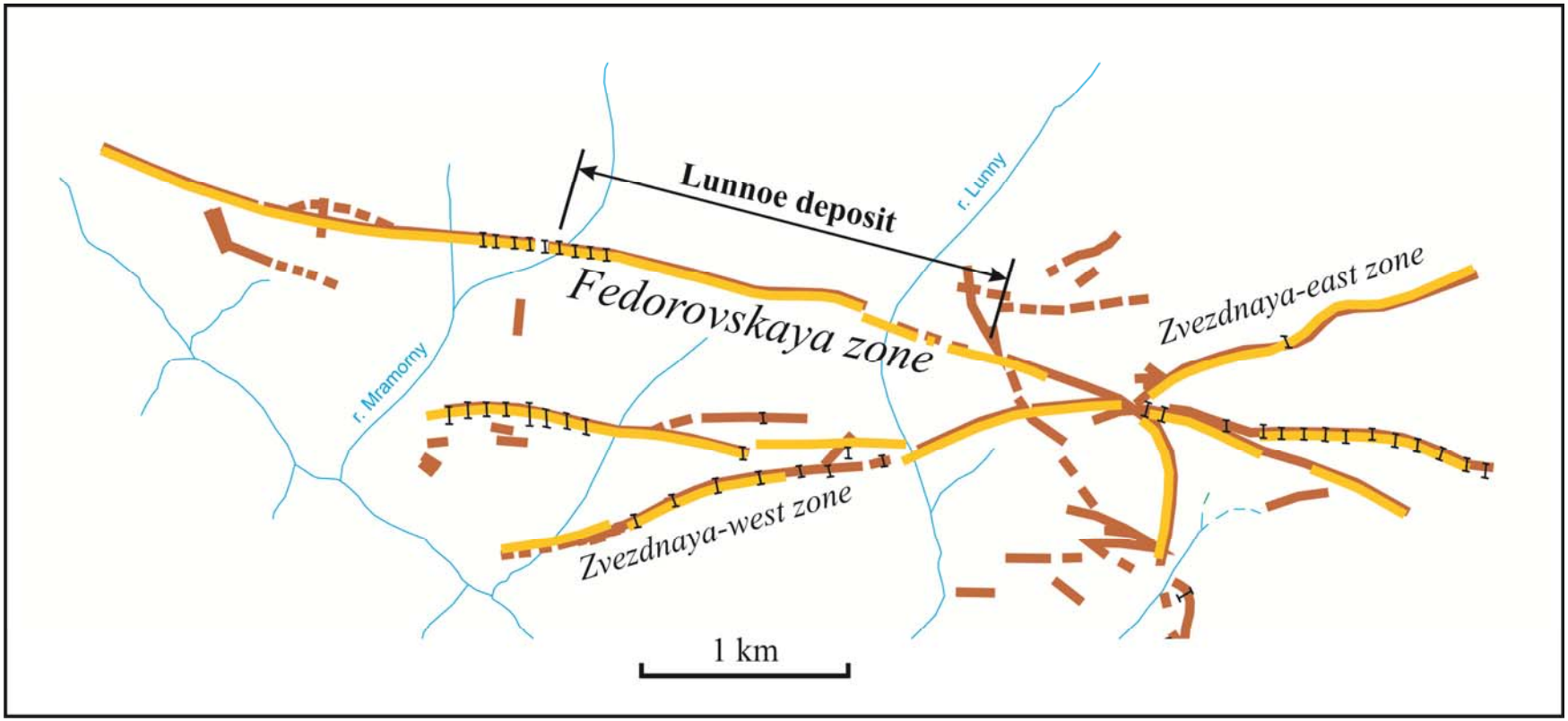


1 – Au-U ore; 2 – U-Au ore; 3 – original rock; 4 – weathering crust

Prognosticated resources

Gold		Silver		Uranium	
kg	g/t	kg	g/t	t	%
19 130	1,1	124 800	7,1	2 000	0,01

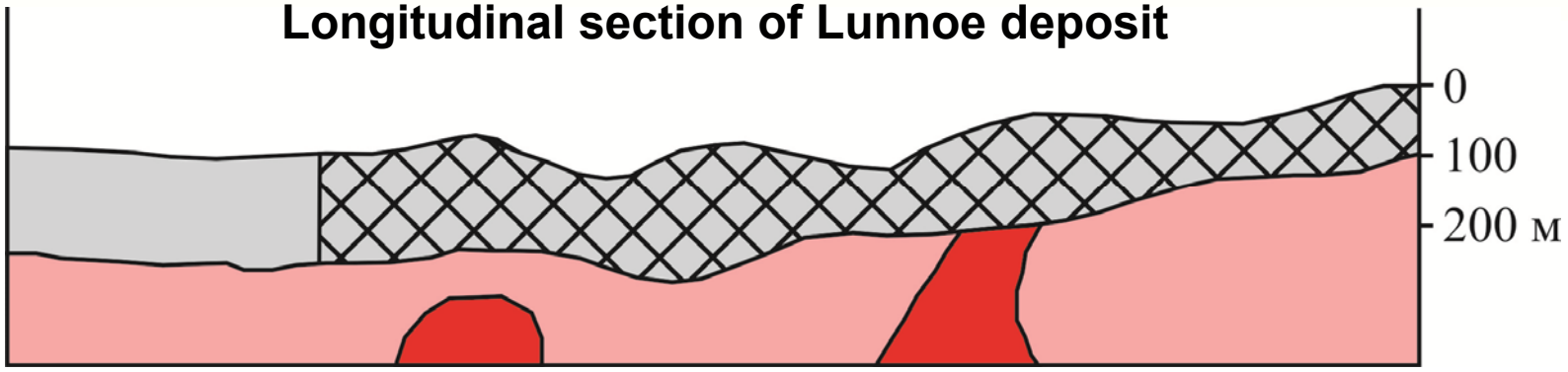
The disposition auriferous tectonic-metasomatic zone in area of Lunnoe deposit



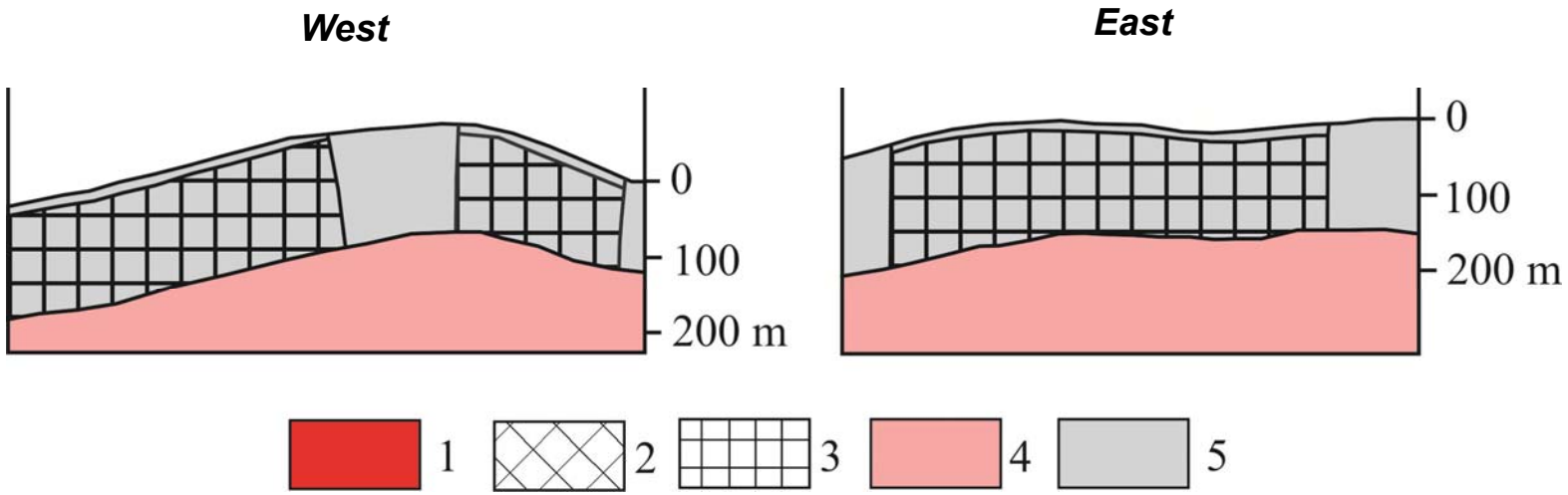
Inferred resources of Lunnoe deposit

Gold		Silver		Uranium	
kg	g/t	kg	g/t	t	%
3 000	3,6	36 200	50	408	0,08

Longitudinal section of Lunnoe deposit

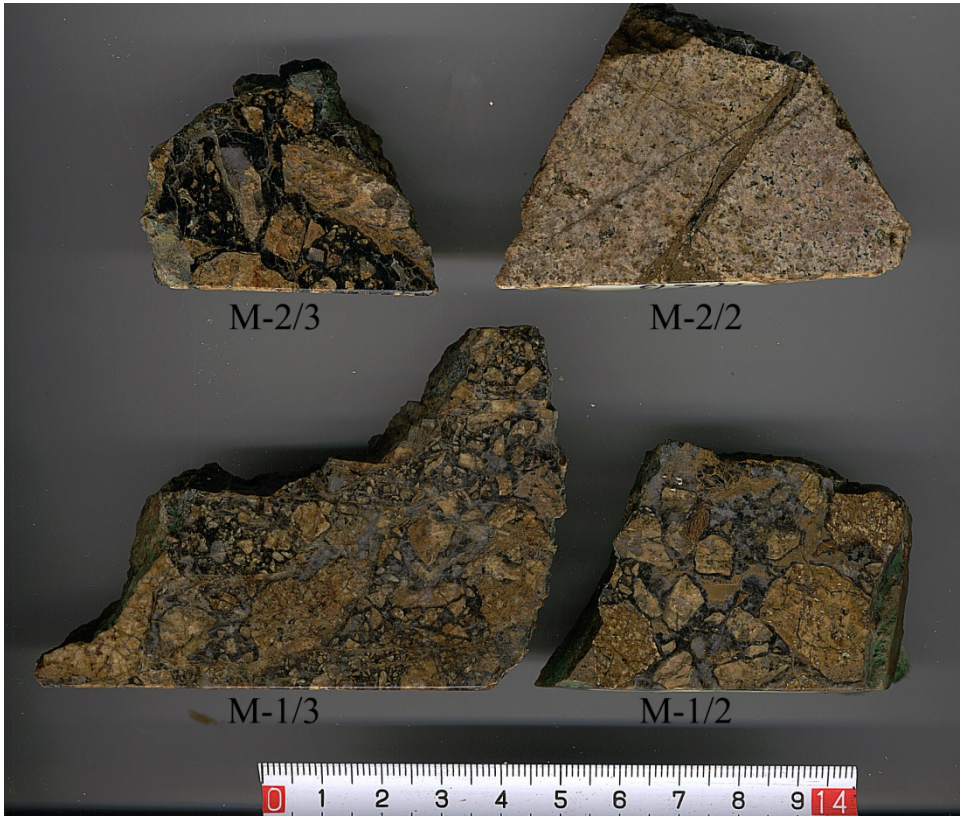


Longitudinal section of Zvezdnaya zone



1 – Au-U ore; 2 – U-Au ore (Inferred resources); 3 – U-Au ore (Prognosticed resources); 4 – original rock; 5 – weathering crust

Weathering crust: trenches and samples



Competitive characteristic of original Au-U ore (I) and U-Au ore in weathering crust (II)

The mineral composition, %

Mineral	I	II
K-feldspar	49,0	45,0
Clay minerals	3,0	13,0
Carbonate	8,0	1,0
Pyrite	5,0	-
Chlorite	10,0	4,0
Iron hydroxide	-	2,5
Plagioclase	15,0	15,0
Quartz	20,0	22,0

The chemical composition, %

Component	I	II
Al_2O_3	10,6	14,6
MgO	3,1	0,2
CaO	10,3	0,8
Na_2O	0,5	0,6
K_2O	6,6	10,0
Fe_2O_3/FeO	3	5,0
$S_{sulph.}$	3,2	-
$\frac{Al_2O_3}{Al_2O_3 + CaO + MgO}$	44	94

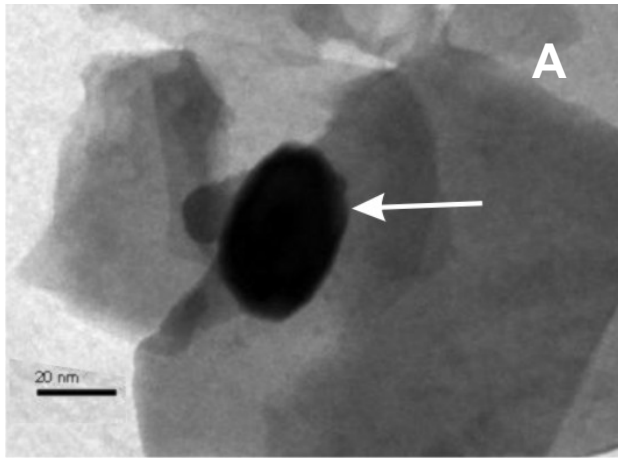
Average content in ore

Component	I	II
U, %	0,14	0,02
Au, g/t	0,8	1-2
Ag, g/t	10	7

Main mineral of U, Au, Ag

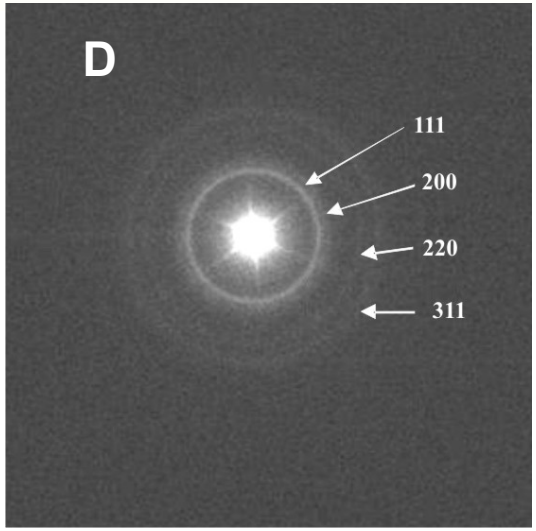
Element	I	II
U	Brannerite	Relict brannerite, Autunite, Uranophane
Au	Gold-contain pyrite	Particle of native gold size 10-20 nm
Ag	Silver-contain sulphide	Acanthite, Arseniargentite

The particle of native gold

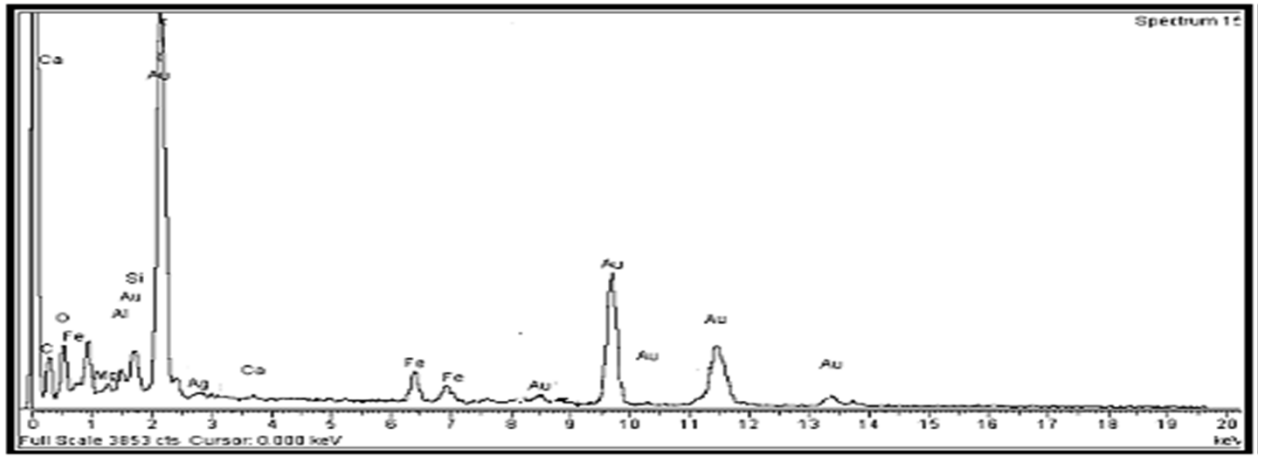


C

Element	Weight%	Atomic%
Au	87.77 +/- 0.80	43.67
C	2.87 +/- 0.16	23.40
O	2.95 +/- 0.15	18.06
Fe	3.01 +/- 0.15	5.29
Si	1.27 +/- 0.10	4.44
Al	0.80 +/- 0.09	2.92
Mg	0.27 +/- 0.07	1.09
Ca	0.24 +/- 0.07	0.58
Ag	0.22 +/- 0.24	0.20
Totals	100.00	100.00

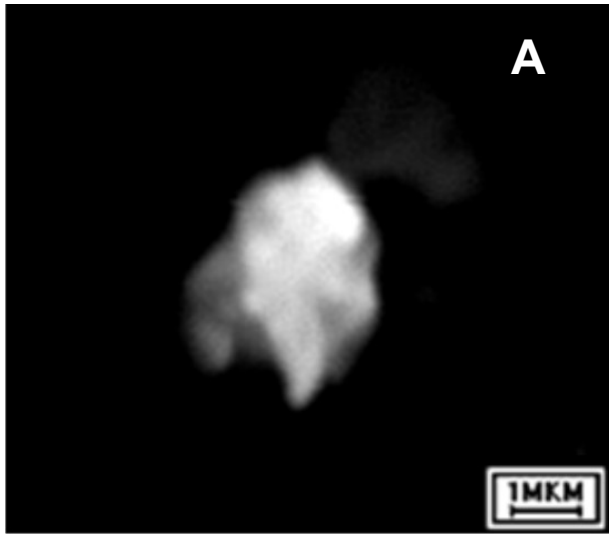


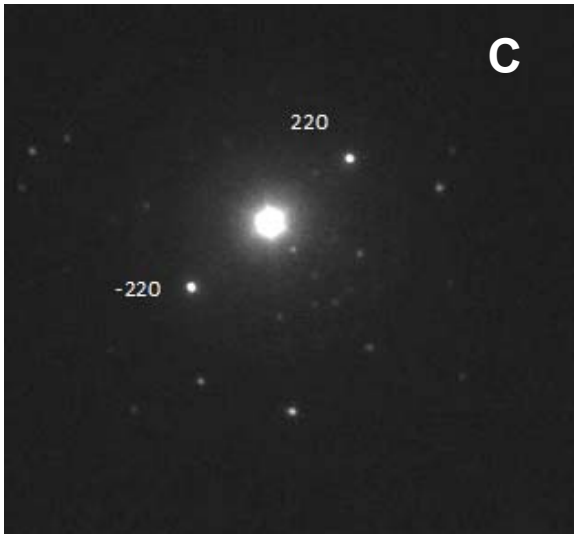
B

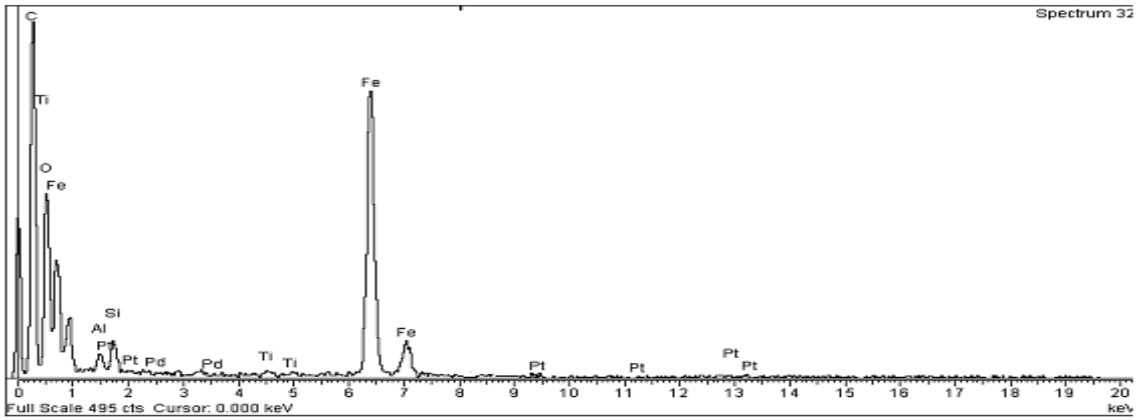


A – oval particle of gold in translucent electronic microscope;
B – roentgenospectral graph of gold particle;
C – table of element content;
D – diffraction of native gold

The particle of polyxene







B

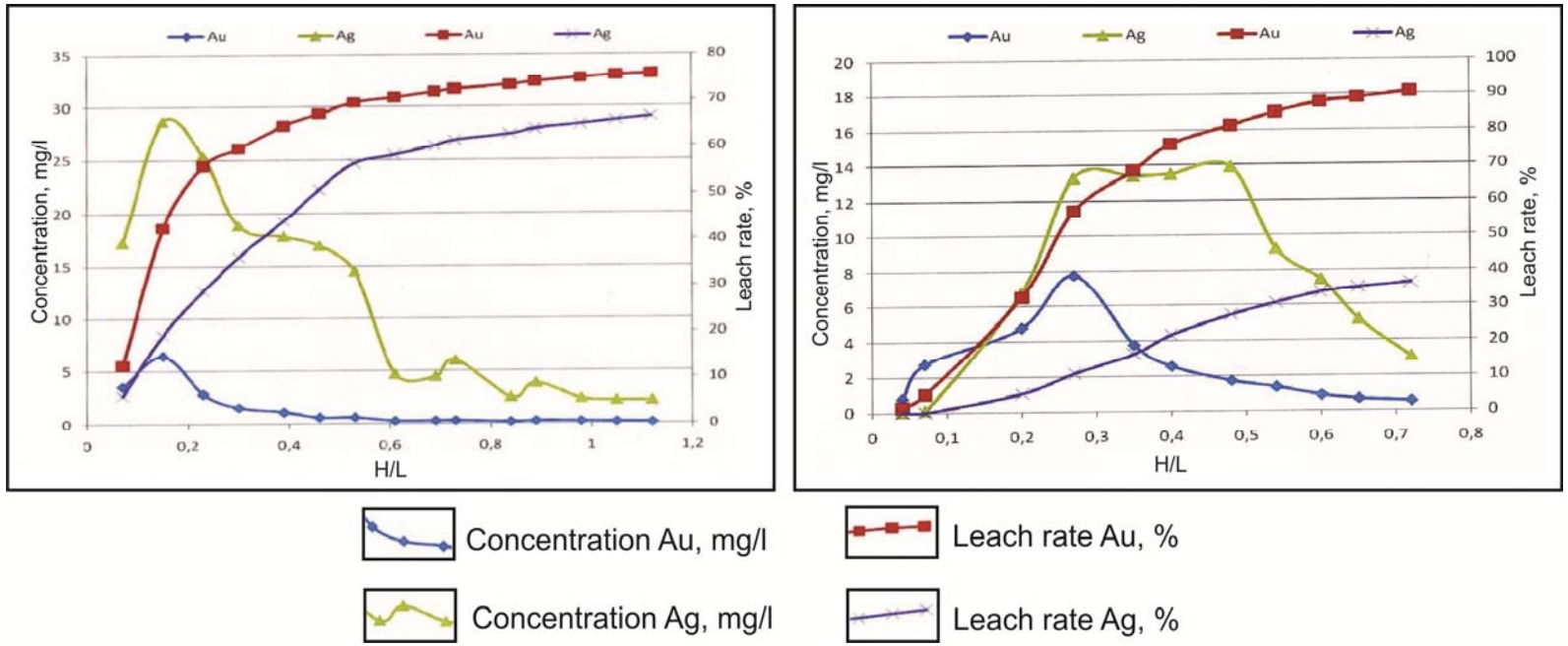
A – particle of platinum mineral;
B – roentgenospectral graph;
C – annular diffraction of polyxene

The results of phase analysis of oxidized and semi-oxidized ores

Mineral form of Au, Ag	Oxidized ores				Semi-oxidized ores			
	Au		Ag		Au		Ag	
	g/t	%	g/t	%	g/t	%	g/t	%
Native, lightly cyanided	1,79	85,2	7,2	42,6	0,56	70,9	3,11	36,0
Copper-mineral association, difficulty cyanided	0,18	8,6	0,7	4,1	0,02	2,5	0,35	4,0
Fe, Mn-hidroxide association	0,03	1,4	0,5	3,0	-	-	0,21	2,4
Gold-silver containing sulphides	-	-	-	-	0,11	13,9	0,37	4,3
Fine- dissemination in silicates	0,1	4,8	8,5	50,3	0,1	12,7	4,6	53,3
Total	**2,1**	**100,0**	**16,9**	**100,0**	**0,79**	**100,0**	**8,64**	**100,0**

Laboratory test date of heap leaching

Change of concentration in solution and leach rate of Au and Ag



Content	Oxidized			Semi-oxidized			Original
	1	2	3	4	5	6	7
Au, g/t	0,98	1,6	1,23	5,9	2,7	2,8	2,08
Ag, g/t	11,7	14,8	10,58	7,7	9,6	15,4	7,6
U, %	0,10	0,02	-	-	-	-	0,048

Leach rate, %	Oxidized			Semi-oxidized			Original
	1	2	3	4	5	6	7
Au	95,3	90,6	96,8	64,2	54,2	75,7	17,8
Ag	54,0	49,4	32,1	30,8	34,6	66,4	27,0
U	87,3	75,0	-	53,4	-	-	14,0

Prognosticated and speculative resources of oxidized and semi-oxidized ores in the area S-400 km²

Tectonic-metasomatic zone	Gold		Silver		Uranium	
	t	g/t	t	g/t	t	%
Severnaya	20	1,1	140	7,1	3800	0,02
Yuzhnaya	80	1-2	560	7,0	15000	0,02
Magnitnaya	30	1-2	300	10,0	5000	0,01
Agdinskaya	30	2-3	600	20,0	5000	0,01
Volodina	20	2-3	400	20,0	4000	0,02
Total	**180**	**1-3**	**2000**	**7-20**	**32800**	**0,01-0,02**


Thank you for
attention