



Absolutely Pure Gold with High Fineness 1000‰

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Abstract. It is identified for the first time that, during process of complicated deformation in eolian conditions - mechanical transformation of flaky gold into toroidal form and then into globular-hollow form, gold is cleaned up to absolutely pure metal with fineness 1000‰. Note that, fineness of this eolian gold is higher than fineness of the reference object, shown by the detecting device (JXA-50A micro-analyzer). In this connection, identified natural process of gold cleaning in eolian conditions can be successfully used in gold metallurgy to obtain absolutely pure gold.

Keywords: Gold · Fineness · Trace elements · Structures · Eolian process

1 Introduction

Native gold in exogenetic conditions, depending on its environment, undergoes gradual changes, in morphology and material composition. It is known that, gold cleaning in exogenetic conditions occurs mainly under chemical and physical-chemical influence in weathering crusts, and also as a result of simple strain in geodynamic conditions. This report will be focused on gold cleaning as a result of impact of mechanogenic processes in eolian conditions.

2 Methods and Approaches

Chemical composition of eolian gold of the Lena-Viluy interfluvium (east Siberian platform) was studied by atomic-absorption spectrography (30 objects), spectral quantitative analysis (50 objects), and at JXA-50A micro-analyzer (30 objects and 200 identifications).

3 Results and Discussion

During mechanical impact of sand grains on gold in eolian conditions, not only the form is transformed, but also inner structure and chemical composition are regularly changed. It is identified that, process of gold cleaning is more intensive in eolian conditions, than in hydrodynamic conditions (Nikiforova 1999).

According to the analysis of eolian gold by atomic-absorption method, increase of gold fineness during transformation of flaky forms into globular-hollow forms from 810 to 970‰ is identified. Flaky gold with scarcely noticeable elevation at the periphery, has fineness range 810–970‰, with average gold fineness 890‰. In toroidal gold, interval of gold fineness fluctuation is identified - 920–970‰, with average index 940‰. Globular-hollow form is characterized by high gold fineness - 960–990‰, with average fineness 970‰.

Spectral quantitative analysis identified that, constant trace elements of flaky forms with characteristic features of eolian transformation are Fe- 0,1; Pb- 0,003; Sb- 0,002 Cu-0,017; Mn- 0,01; Pd- 0,002.; Ni-traces; Hg- traces. And some other. In toroidal gold, a smaller set of trace elements is identified Fe- 0,1; Cu-0,02; Mn- 0,03; Ni- traces; Hg-traces, and in globular-hollow body only these trace elements are identified – Fe- 0,1; Cu-0,05; Mn- 0,001.

Study of fineness of different areas of gold particles (Table 1 and Fig. 1) allowed identifying that, a flake with medium-grained structure (grain C-9a) has fineness from 747 to 780‰, and its more high-standard shell – from 950 to 988‰. Flake P-138 with partially recrystallized rim has gold fineness 900–970‰, and its central part 814–860‰. Fully recrystallized flake showed maximum gold fineness – 990–1000‰. Fineness of globular-hollow gold within one sample is not just high, but has an absolute value - 1000‰. For example, 17 identifications in the grain 60a found insignificant fluctuations of fineness within interval 992–1000‰, and 13 identifications in the grain 60b showed the highest gold fineness – 1000‰.

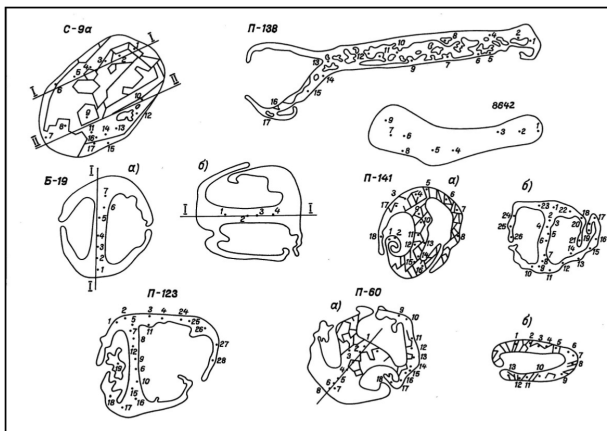


Fig. 1. Section of gold particles and points of fineness identification

Table 1. Fineness of particular areas of gold particles, ‰

Points of fineness measurement	Morphologic type of eolian gold									
	Flaky			Globular recrystallized						
Index of the sample	C-9a	P-138	8642	Б-19a	B-19б	P-141a	P-141б	P-123	P-60a	P-60б
1	759	973	998	903	860	990	997	1000	996	1000
2	747	941	996	912	867	Not identified	992	955	996	1000
3	759	933	998	907	869		983	997	999	1000
4	756	Not identified	984	904	919	990	991	999	1000	1000
5	757	908	994	912		988	985	996	999	1000
6	755	920	997	902		996	996	995	997	1000
7	758	860	996	901		980	987	1000	992	1000
8	769	892	997			999	984	938	992	1000
9	766	978	1000			980	970	930	999	1000
10	953	814				989	995	993	994	1000
11	783	896				994	985	997	1000	1000
12	979	806				993	995	995	1000	1000
13	986	956				990	987	not identified.	1000	1000
14	970	937				920	995		1000	
15	974	973				932	1000	903	1000	
16	988	974				994	988	912	1000	
17	970	900				998	987	910	1000	
18						987	1000	1000	1000	
19							998	999		
20							984	Not identified		
21							991			
22							1000			
23							983			
24							996	1000		
25							998	1000		
26							999	1000		
27								1000		
28								1000		

It should be emphasized that, shell of globular-hollow forms constantly shows absolutely high fineness 1000‰. Just in several samples, primary gold preserved in partition, is characterized by lower fineness within a range from 860 to 919‰, for example grain 19b.

Increase of gold fineness in eolian conditions is explained by the fact that, as a result of complex deformation of flaky gold, very thin films of gold (fraction of mcm) are formed, being overlapped on each other, generate a shell of globular forms. In addition, surface for active chemical interaction of metal with environmental elements is increased, that contributed to the maximum removal of silver and trace elements from primary gold particles.

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The process of mechanically gold cleaning was proved by (Lechtman 1979) experimentally. According to the results of his experiments, clean layer of gold appeared after multiple alteration of forging of gold and copper alloy, with its processing in weak ammonia solution, where initial gold content did not exceed 12%.

4 Conclusions

It is identified for the first time, that during complex deformation, when flaky gold is mechanically transformed into toroidal form and then into globular-hollow form, metal is cleaned to absolutely pure gold with fineness 1000‰. Identified natural process of gold cleaning in eolian conditions can be successfully used in gold metallurgy to obtain absolutely pure gold.

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