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Model of the new gold deposit Mananila (Tanzania)

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SUMMARY

A new gold deposit Mananila was discovered in the northern part of the Morogoro province of the Republic of Tanzania. In this region, where the Proterozoic structures of the Uzagaran mobile belt were developed, until any significant manifestations of gold mineralization wasn't known. Mananila deposit represent by a large volume object, from 400 to 450 meters long, and from 60 to 80 meters thick. Mineralized weakened zone presented by over intensely leached and schistosed migmatites, gneisses, amphibolites, penetrated by echelon systems of quartz veins and veinlet, steeply dipping bodies of quartz breccia from 1.0 to 1.5 meters thick. Gold content is from 0.61 to 8.11 g/t, the average content is from 2.5 to 3.0 g/t. Similar structures, which parallel to the main zone, developed on this site, although they have lower thickness. The inferred resources of the deposit are estimated about 20 tons of gold. All these objects are located within a large weakened zone of northeast-ern strike with a width of 4–5 kilometers and a length of over 20 kilometers. This information serves as the basis for the identification of a new gold ore region in the northern part of the Morogoro province of Tanzania, within the Proterozoic mobile belt of Usagaran. The possible gold mineralization this region never has been previously discussed in geological literature.

Introduction

Urgency of researches is caused by total high prospects of gold mineralization of the Republic Tanzania, which holds the third place in Africa (after the Republic of South Africa and Ghana) on probable resources (about 2000 t), total (1090 t) and proved (630 t) reserves and gold production (annually from 45 to 50 t). Main gold mining companies are Barrick Gold (mines Tulawaka, Bulyanhulu, Golden Ridge, Buzwagi), AngloGold (Geita), Acacia (North Mara), Resolute (Golden Pride), Meremeta (Buhemba), Twigg (Miyabi Hill), Lakota (Sekenke), Shanta Gold (New Luika) etc. Gold deposits discovered (more than 20) in three gold structures: gold-bearing zone of Victoria lake located in northwest of Tanzania and associated mostly with Archaean greenstone belts (GSB); Lupa and Mpanda ore fields located within Paleoproterozoic mobile belts of West Tanzania. Addition of gold reserves is an essential task not only for the prospecting industry of Tanzania, but also for gold mining industry of the world.

Ore districts, especially gold-bearing zone of Lake Victoria, are thoroughly described in many scientific publications. They discussed about geological structure, age, gold metallogeny, origin and occurrence of gold mineralization (Cook et al., 2016; Kabete et al., 2012; Kwelwa et al., 2018; Many, Maboko, 2008; Sanislav et al., 2017; Tumsifu, 2013). However, all these deposits located in the northwest and west areas of Tanzanian Shield, where intensive gold mining is carried out for more than 100 years. But east area of Tanzanian Shield, namely, the administrative province of Morogoro, doesn't have scientific publications about gold mineralization here. This paper considers new information of gold mineralization recently find here.

Result

Until recently there were no any significant gold occurrences found here and most gold in this area is produced by local, gold-digger prospects with low production rate. At the same time, our prospection works carried out during March-April of 2018 had shown that Mananila site, which is located in the northern area of Morogoro province, have a gold potential. As a result of investigations carried out the new type of gold mineralization was found. It refer to large-scale mineralized structures, which localized within tectonically sheared zones of Early Precambrian granitic-gneisses. The total area of the site is about 1.5 km².

The Tanzanian craton is being one of Precambrian stable massifs of the African continent and characterized by zonal structure. Its central area is consisted of Archaean highly metamorphosed rocks of Dodoma complex (gneisses, granulites, granite-gneiss, migmatites) which superimposed GSB located in the north, near Lake Victoria. These belts include greenstone associations of Nyanzian system that are also have Archaean age. Gold mineralization of the region is mostly associated with these greenstone belts: Geita, Tulawaka, Bulyanhulu, Golden Ridge, Buzwagi, Golden Pride, North Mara and other deposits.

The core area of the craton is surrounded by Proterozoic mobile belts: Ubendian belt from NNW to submeridional strike in the west and Usagaran belt from NNE to submeridional strike in the east. Gold deposits of Lupa and Mpanda ore fields are associated with Ubendian belt (New Luika, New Saza-Razorback, N'Tumbi, Mukwamba). Until recently there was no any information about gold deposits associated with Usagaran belt. According to the tectonic scheme [Kabete et al., 2012], the studied area is located within Uluguru-Pare Neoproterozoic superterrane of East tectonic zone in the South East African orogeny. This orogeny is mostly comprised by gneisses, granites, granodiorites in association with porphyrites and felsites.

The area of researches is located in the northern area of the superterrane. This area is comprised by gneisses, granite-gneiss, migmatites, which are characterized by striped texture. Large sheared zone on NNE strike, which is up to 4–5 km wide and more than 20 km long, can be identified on the basis of satellite images. Until recently, large gold mineralization was not found in this area. This situation changed a few years ago when the Mazizi Goldmine Company has started exploration works on the site of old gold-digger mines, in the result was discovered Mazizi deposit. The deposit occurs as steeply-dipping (70–75° in the northwest) mineralization zone that is extended in the northeast direction (50–

60°) over 450 m. Its thickness reaches 50–70 m and contains of gold makes 40–80 g/t (Mazizi Gold Mine).

In 2018, exploration works were carried out on license site of Mananila. The site is situated in 25 km to the northeast of Morogoro city which is an administrative center of Morogoro province of Tanzania. The site is located in 2.8 km to the west of Mazizi deposit. Its total area makes 1.5 km².

The main result of exploration works is a discovery of Mananila deposit. Its inferred resources are estimated about 20 t of gold according to P₁₋₂ category.

Among host rocks of mineralization zone in Mananila site are pinkish-grey gneisses (to migmatites) and black amphibolites. They gently deep to the ESE (110–130°), dip angle < 20°. The main mineralization zone is represented by intensively bleached and sheared migmatites, gneisses, amphibolites which cut by echelon systems of quartz veins and veinlets of mostly northeast strike (60–70°). These veins form stockwork systems with veins and veinlets striking to the northwest (310–320°). Sometimes steeply-dipping bodies of quartz breccia that show strikes to northeast and northwest and thickness reaching 1.0–1.5 m might be found.

Main zone can be characterized by following parameters: strike – northeast (65–70°), extent along strike – up to 430 m, width – up to 60–80 m in central part of the zone and wedges out on its flanks. Quartz is mostly represented by white massive and glassy-like varieties without any visible indicators of mineralization. More rarely, it is represented by pinkish-gray and yellowish-gray sugar-like varieties with microscopic inclusion and thin hair-like inclusions of sulfides, sometimes gold.

All selected samples show high values of gold content – from 0.61 to 8.11 g/t. These facts could indicate on possible occurrence of large gold-bearing structure which is incompletely uncovered by two profiles of trench. Average content of gold ranging from 2 to 3 g/t. (Fig. 1)

The first intersection uncovered the ore zone that is more than 75 m wide with average gold content of 2.72 g/t. At the same time, several intervals show gold contents reaching 5.91 g/t on 2.0 m, 6.87 g/t on 1.2 m and 8.11 g/t on 1.5 m. Some lump samples selected from quartz breccia situated within the zone show the gold content values reaching 5.19 g/t and 7.25 g/t.

The second intersection uncovered the ore zone that is more than 40 m thick, with average gold content reaching 1.10 g/t. Lump sample collected from waste piles of quartz breccia situated within the zone show content of gold reaching 6.22 g/t.

In both cases, the ore zone uncovered at full capacity.

Besides the Main zone of mineralization presence at least three similar zones of mineralization. But they can have smaller thickness within of license site. They can be established based on presence of waste piles of quartz breccia, which gold content reaches 4.37–4.71 g/t.

Total probable resources of ore mineralization on the site estimated about 20 t of gold.

The results obtained make it possible to suppose presence at least three types of mineralization and, respectively, three types of ore bodies.

First of all, these are quartz veins and breccia of northeast strike which thickness ranges from several centimeters to several meters, with rather high content of gold (from 4.37 g/t to 8.11 g/t). In some cases fine impregnation of sulfides and gold can be observed in quartz.

Most of the mineralization is associated with the scattered inclusion of gold in intensively sheared migmatites, gneisses and amphibolites, with numerous small and thread-like veins and veinlets of quartz. It is these veins which form large-sized ore body in the Main mineralization zone. Average content of gold is about 2–3 g/t.

The third type of mineralization is presented by areal cover of laterites. They have thickness ranges from 0,5 to 2–3 m, and sharply increasing to northwest of the site. Gold content of lateritic weathering crusts that occur directly above the ore body reaches 1.75–4.71 g/t.

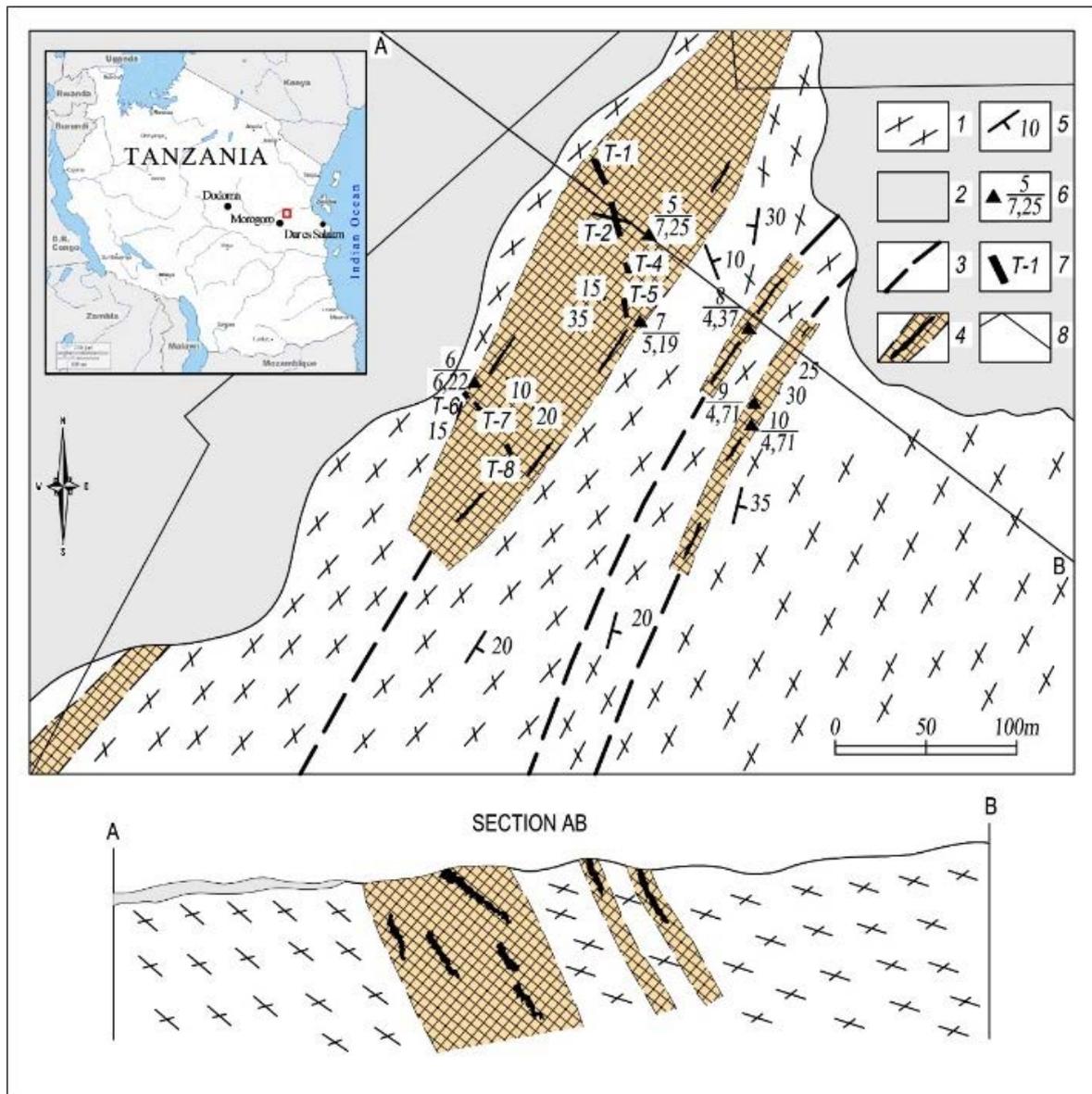


Figure 1 Geological model of Mananila deposit::

1 – gneisses and migmatites; 2 – laterites; 3 – faults; 4 – mineralization zones: bleached schistosed gneisses with small, usually layered, quartz veinlets and separate veins of quartz breccia up to 1.0–1.5 m thick; 5 – bedding elements; 6 – location of lump sampling, their numbers (in numerator) and contents of gold, g/t (in denominator); 7 – trenches, their numbers; 8 – contours of license site

Conclusions

As a result of the investigations carried out in the north of Morogoro province of the United Republic of Tanzania find new, earlier unknown Mananila gold deposit. Probable resources are estimated around 20 t of gold. New type of gold mineralization established, which associated with large-scale mineralized structures of sheared zones occurred in early Precambrian granite-gneisses complexes. The Mananila deposit located not so far from the Mazizi deposit. In addition in this ore field number of small gold manifestations known which is working out by gold-diggers. Spatial closeness to gold objects, their occurrence within the sheared zone of northeast strike and its large size make it possible to outline new perspective gold ore field in the north of Morogoro province, East tectonic zone of the Tanzanian craton.

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