

1.1. Left slope of the Maly Creek valley is composed of dunite with the platinum-group minerals occurrences in chromitites. Exploration trenches and drill lines are along the roads. Open pit of the Verkhnee platinum-group minerals prospect (indicated by arrow). At far is the northwestern part of the Konder ring range, at the bottom of which boulder-sand-pebble mixed technogenic sediments of abandoned placer of the Konder River upstream and flowing creeks are present. Photo of 2011.



CHAPTER 1. GENERAL INFORMATION ON PLACER-FORMING PLATINUM MINERALS AND THEIR ASSEMBLAGES

Archeological data show that platinum was known to ancient Egyptians, citizens of Roman Empire, and Inca, indigenous people of South America. In the early 18th century, the Spaniards produced first placer-forming platinum minerals from placers in Colombia. In the early 19th century, minerals of the native osmium–iridium row were found in gold placers of Upper Neiva in 1819, and, in 1824, first economic PGM placers were discovered in the Chusovaya Valley, both in the Urals, Russia. More than 300 tons of platinum-group metals were produced from the Urals placers during 100 years of operation. The Isa and Tura placer clusters, extending for more than 200 km, produced approximately 130 tons, whereas Gora Soloviova (Solovieva Mountain) placers in the Nizhny Tagil district produced approximately 125 tons. They were giant among the Ural placers (Vysotsky, 1923, 1933).

The Uralian platinum placers were of global significance until the 1930s when they were exhausted. New PGM sources were discovered in complex Cu–Ni and chromite deposits in differentiated ultramafic–mafic intrusions (Bushveld, Noril’sk and others; Wagner, 1932; Urvantsev, 1981). Many people believed that platinum placers had been exhausted as economic deposits. However, exploration works in the Ayan–Maya district in the north of Khabarovsk Krai in 1979–1988 resulted in discovery of the giant placer at the Konder and Uorgalan rivers with 120 t of platinum-group metals in reserves. This stimulated extensive prospecting for platinum placers in many districts of the Former Soviet Union, first of all in Russia. To date, new platinum-group elements (PGE) placers have been discovered at Mokhovaya–Chad rivers and Feklistov Island in Khabarovsk Krai, Inagli River in Yakutia; Ledyanoi, Levtyrinyvayam, and Penisty creeks in the Kamchatka Peninsula; Maya–Khatyrka rivers in Magadan Oblast, and rivers draining the Guli Massif in the Krasnoyarsk Krai (Mochalov, 1997).

The number of such placers is substantial for Russia and globally. However, 85% of the platinum-group metal reserves are concentrated in a fairly limited number (dozen) of large (> 20 tons of metal) and unique (more than 50 tons) placers. Outside of Russia, these are very large placers of platinum-group metals at the Atrato–San Juan rivers in the Chocó Department in Colombia, Tulameen–Similkameen rivers in Canada, Kuskokwim–Salmon rivers in Alaska, USA, and iridosmine paleoplacers in the Witwatersrand conglomerate in South Africa (Feather, 1976; Cabri *et al.*, 1996).

Placer is a local area of anomalous concentration of valuable minerals in sediments formed by destruction of more ancient rocks. Mineralogy and concentration of valuable minerals in placers depend on:

(1) features of primary rocks,