ORIGINAL RESEARCH PAPER

Volume-8 | Issue-8 | August - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

OCCURRENCE OF MICRO-RUBIES, IN BEACH PLACERS OF THE KANNIYAKUMARI BEACHES, SOUTHEASTERN COAST OF INDIA

Geology

Manish Kumar Purohit*

Centre of Advanced Study in Geology Dr H. S. Gour University, Sagar-470003, M. P., India *Corresponding Author

KEYWORDS

Ruby, beach placer, kanniyakumari, eastcoast

Occurrence of micro rubies (0.5mm) with reddish, blue and pale blue colour, cylindrical to rounded shape and characteristics X ray diffraction spectra is reported for the first time from beach sands of Kanniyakumari Region along the East coast of India. The study opens up new exploration target area for placer deposits of gem stones in this region.

Ruby belongs to the hexagonal system and may be differentiated from other non-isotropic heavy minerals owing to anisotropism, very high relief, distinct cylindrical shape, form and morphology. They reflect more amount of light from their surface compared to other heavy minerals[2]. Their form is mostly cylindrical. Rubies are also recognized by physical properties like hardness, specific gravity, fluorescence, thermal conductivity, transparency to X-rays, etc. The morphological and optical characteristics of Ruby are also seen in micro- rubies with conchoidal fractures and adamantine lustre.

Srilanka, Afghanistan and Hindicheen are among the major producers of Ruby. The most vitreous ruby is found in the Mogok mines in Burma[2, 7]. The rubies in these mines occur *in situ* in crystalline limestone, and also in the soil of the hillsides and gem-bearing gravels of the Irrawaddy River1, [7]. It is believed that Mogok mines provide ruby in plenty since hundreds of years. In India, Atomic Minerals Directorate for Exploration and Research (AMD), Hyderabad has been exploring beach placers along the Indian coats for heavy minerals for over half a century, by systematic sampling (by drilling) up to the physical limit of the sand body. Marine Wing of the Geological Survey of India and National Institute of Oceanography; Goa, have also carried out heavy mineral surveys on beach sand bodies along its east coast for over five decades. Occurrences of a number of heavy minerals from these sands like Zircon, Garnet, Monazite, diamond, Tourmaline, Epidote, Horneblende, Kynite, Staurolite, Rutile, Andalucite, Sillimanite, Sphene, Biotite and Ruby is well established[4,5]. Beaches of eastern coast of India portray annual sum of all the products derived from the catchments of nearby rivers, coastal belt and the continental region and also include shelf detritus, i.e. grains derived from the coastal rocks with concentration of heavy minerals. They are considered valuable from sedimentological and economical point of view and are the most productive sources of heavy minerals in the world. A red variety of the corundum (Ruby) has not been reported from anywhere in the eastern India.

This communication reports, for the first time occurrence of micro rubies from beach placers of the Kanniyakumari region. The locations of these occurrences are named as Kanniyakumari-I (08º5'; 77º35') and Kanniyakumari-II (08º04'; 77º35'). The results reported here form a part of detail evaluation study of heavy mineral resources along the east coastal tracts of the country. A regional study on texture, composition and distribution of heavy minerals from 16 sandy beaches along the entire east coast of India covering a coastal stretch of around 2500 km from Puri to Kanniyakumari[4] was taken up with a view to assess the potential of these sands as host of precious and semi precious stones. A number of suspected grains of Ruby have been observed in these sands. These grains are conscpicusly different from rest of the heavy mineral population in terms of their high relief, reflectivity and morphology. These grains, though few (15 grains in a total of 20g) in number, owing to their distinct morphological features have been studied in details. Samples from Kanniyakumari has yielded 03 grains of Ruby, showing high relief, high reflectivity and morphology, that differ from optical characteristics of other heavy minerals. The whole-grain study using stereo binocular microscope and mounted-grain study using petrological microscope and XRD data confirmed these minerals as micro-rubies[4,5].

Nine samples, 500 g each, were collected on grid pattern (three across and three along the beaches) at a distance of 2 m from each other across the beach and 5 m along the beach at each station. The samples were dried and mixed thoroughly to obtain a 50g representative fraction from all the stations by coning and-quartering. The samples were then wet-sieved to wash the dissoluble substances in 230 ASTM sieves (phosphor bronze metal) with 0.063 meshes opening until clear water started coming. The total outflow was kept under 1000 ml volume. The filtered fraction was wet-sieved through a sieve set (30, 60, 100, 150, 200 µm and Pan) to separate the mesh fractions of sediments for quantitative and qualitative analyses. The fractions were then dried again in a hot aerated oven on 50°C and weighed separately to obtain their weight percentages. The cleaned fractions (+30, +60, +100, +150, +200 mesh) were separated for heavy minerals like magnetite ilmenite, rutile, zircon, garnet, sillimanite and monazite using bromoform (2.89specific gravity) as a separating medium and centrifuged for 10 min. All the grains showing typical shape were hand-picked and identified as micro-ruby using a polarizing microscope in a methylene iodide medium (R.I.:1.8) for morphological and optical characters[3]. Samples from only two stations, viz. Kanniyakumari-1 and Kanniyakumari-2 yielded cylindrical (Red ruby) and well rounded (blue or purple ruby)

In Kanniyakumari-1 sand samples, the average size of micro-rubies is of the order of 0.5 mm (Tables 1 and 2). These have been recovered from +60 µm mesh (2.75 phi) fraction as pale blue, cylindrical and translucent detritus without inclusions (Figure 2 c). In the Kanniyakumari-2 samples yielded typical rubies with an average size of about 0.5 mm and have been recovered from +60 µm mesh (2.75 phi) fraction as reddish pink, transparent and cylindrical (Figure 2a). Other type of the ruby is characterized by blue colour, translucent and rounded in shape (Figure 2). The rubies in Figure 2 *a* and *c* are slightly to moderately etched and the one shown in Figure 2 *b* is cleaved.

Though the size of the micro-ruby extracted from beach sands of this area is very small and points to a longer distance of transport their perfect cylindrical and rounded shape however indicate their release from a nearby (alluvial?) sourcealso[2]. Nevertheless, possibility of their occurrence, however, at the two stations in coarser sediments may not be ruled out. With a view to confirm the identification of these micro rubies, XRD studies have been carried out on two samples. The XRD of the two samples authenticates occurrence of micro-rubies (peak values 2.09, 2.55 1.60, 3.78, 1.37, 1.74 and 2.38)[3,4].

This preliminary study reported here reveals the presence of gem variety rubies in beach sands of Kanniyakumari area and opens up new target areas for further detail exploration for gem stones.

ACKNOWLEDGEMENT

I thank the Department of Applied Geology, Doctor Harisingh Gour University, Sagar for providing infrastructural facilities and M/s TATA Refractories, Belpahar, District Jharsugoda, Odisa, for carrying out X-Ray Diffraction analyses of sediments samples. The micrographs were taken using Carls-Zeiss Microscope (STEMI 2000), procured under the FIST programme of the Department of Science and Technology (DST), New Delhi.

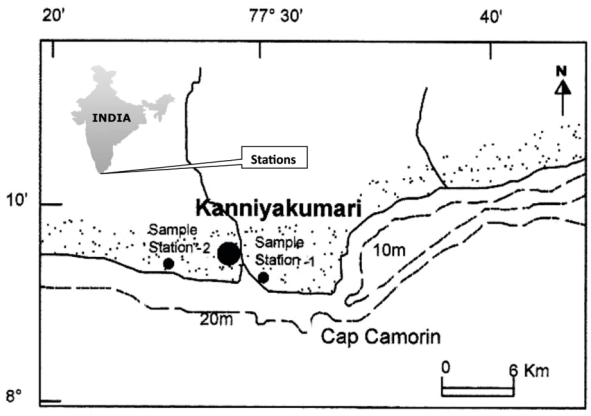

Table 1. Granulometry at Kanniyakumari-1 and Kanniyakumari-2 beaches

St. No	Wt %									
	30		60		100		150		200	
	Phi	wt %	Phi	wt %	Phi	wt %	Phi	wt %	phi	wt %
1	0.75	47.515	2.0	12.658	2.75	4.303	3.32	30.724	3.75	2.018
2	0.75	0.253	2.0	3.291	2.75	56.151	22.379	15.893	3.75	1.823

1. Kanniyakumari-1, 2. Kanniyakumari-2

Table 2. Distribution of heavy minerals at Kanniyakumari-1 and Kanniyakumari-2 beaches

St. No	Nos. per 50gm													
	Z i	g t	Mon	tour	epi	hb	Ru	ky	s t	and	sill	sph	bio	rub
1	17099	3197	15	519	31	37	19	13	15	17	13	05	45	06
2	16413	2823	12	423	41	23	22	12	9	14	16	03	52	09

1. Kanniyakumari-1, 2. Kanniyakumari-2

Heavy minerals – zi, Zircon; gt, Garnet; mon, Monazite; tour, Tourmaline; epi, Epidote; hb, Horneblende; ky, Kynite; st, Staurolite; ru, Rutile; and, Andalucite; sill, Sillimanite; Sph, sphene; bio, Biotite; rub, Ruby.

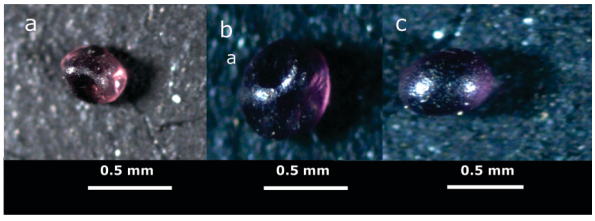

Fig. 2. Micro-rubies, a & b from Kanniyakumari-2 & c from Kanniyakumari-1 beach-sands, east coast of India.

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