SHORT COMMUNICATION

A NOTE ON DIAMOND INCIDENCE IN WAIRAGARH AREA, GARHCHIROLI DISTRICT, MAHARASHTRA

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Incidence of diamond is reported from the highly deformed polymictic conglomerates of suspected Early Proterozoic age from Wairagarh area, Garhchiroli District, Maharashtra. The gem quality diamond recovered during the ongoing search for kimberlite-lamproite rocks in western Bastar craton is an octahedral crystal with a light greenish tint and weighs 0.029g (0.15 carat). Reports of diamond mining in Wairagarh date back to as early as 15th century (Ball, 1884; Satyanarayana, 2000). Mining activity continued till 19th century (Streeter, 1882). These records provide information about richness of the mines and quality of the diamonds won. Despite intensive search by local people, there are no records of diamond recovery for over a century. The present find is first of its kind during the modern times and has opened up new vistas of diamond search in similar geological milieu in the western part of Bastar craton.

GEOLOGICAL SETTING

The Wairagarh area exposes a narrow stretch of (~20 km x 6 km), NNW-SSE trending, low grade, highly deformed metasedimentary belt within the terrain occupied by Archaean Amgaon Gneiss and occurs in the western part of the Bastar craton (WBC) (Fig 1). The metasediments comprise framework- supported polymictic conglomerate, gritty and pebbly arenite, quartzite and quartz-mica schist. Polymictic conglomerate dominates the metasediments and is made up of mixed assemblage of clasts of different composition and size set in a well-foliated quartz- sericite matrix (Fig.2 A). Quartzite dominates the clast population accounting for nearly 80 %, and the remaining includes gneiss, vein quartz, banded ferruginous quartzite and meta-basic rock. The deformed clasts display high degree of flattening and shearing and the host rock records variable (subhorizontal to steep) stretching lineation. The conglomerate grades laterally in to gritty quartzite and mica schist. The ductile shear zone occurring along the eastern margin of Sakoli Fold Belt (SFB) (Roy et al. 1992) passes through the sediments resulting in strong deformation of the basement - cover rocks.

The Wairagarh metasedimentary unit (WMS) appears to have been deposited over the gneissic basement. The basement gneisses also show evidence of intense deformation, which has resulted in the development of a strong mylonitic fabric. The Dongargarh Granite dated 2465 - 2270 Ma by Sarkar (1994), occurs along the eastern margin of the WMS. The contact between granite and metasediments is by and large covered by alluvium. However, in the south central part a lensoid body of granite occurs in the metasediments that probably indicates the intrusive nature of Dongargarh granite. The lensoidal granite body, which is megascopically comparable to the main batholith, does not show any evidence of strain. Younger cover rocks of platformal facies of probable Pakhal Group (Meso- to Neoproterozoic) and lower Gondwana afffinity (Talchir) occur to the western and northwestern part respectively. The rocks of Pakhal Group, which occur as a thin veneer of bouldery outcrops, show occasional inliers of deformed basement gneisses.

The stratigraphic status of WMS is still not clear. Some workers have considered it to be equivalent of Dongargarh Group (Roy et al. 1996), while others (K.G.Bhoskar, *pers. commn.*) equate them with the lower Sakoli Group on the basis of their lithological character and proximity to the Sakoli fold belt (SFB). However, none of the two groups of workers have correlated the WMS with any specific formations of either Dongargarh or SFB. The presence of undeformed Dongaragarh Granite along the south-central part suggests the granite to be probably intrusive into the sediments, which suggests an early Proterozoic age to the WMS. The total absence of granite clasts in the poorly sorted WMS also supports this age.

NATURE OF OLD WORKINGS

The conglomerate was extensively mined for diamonds

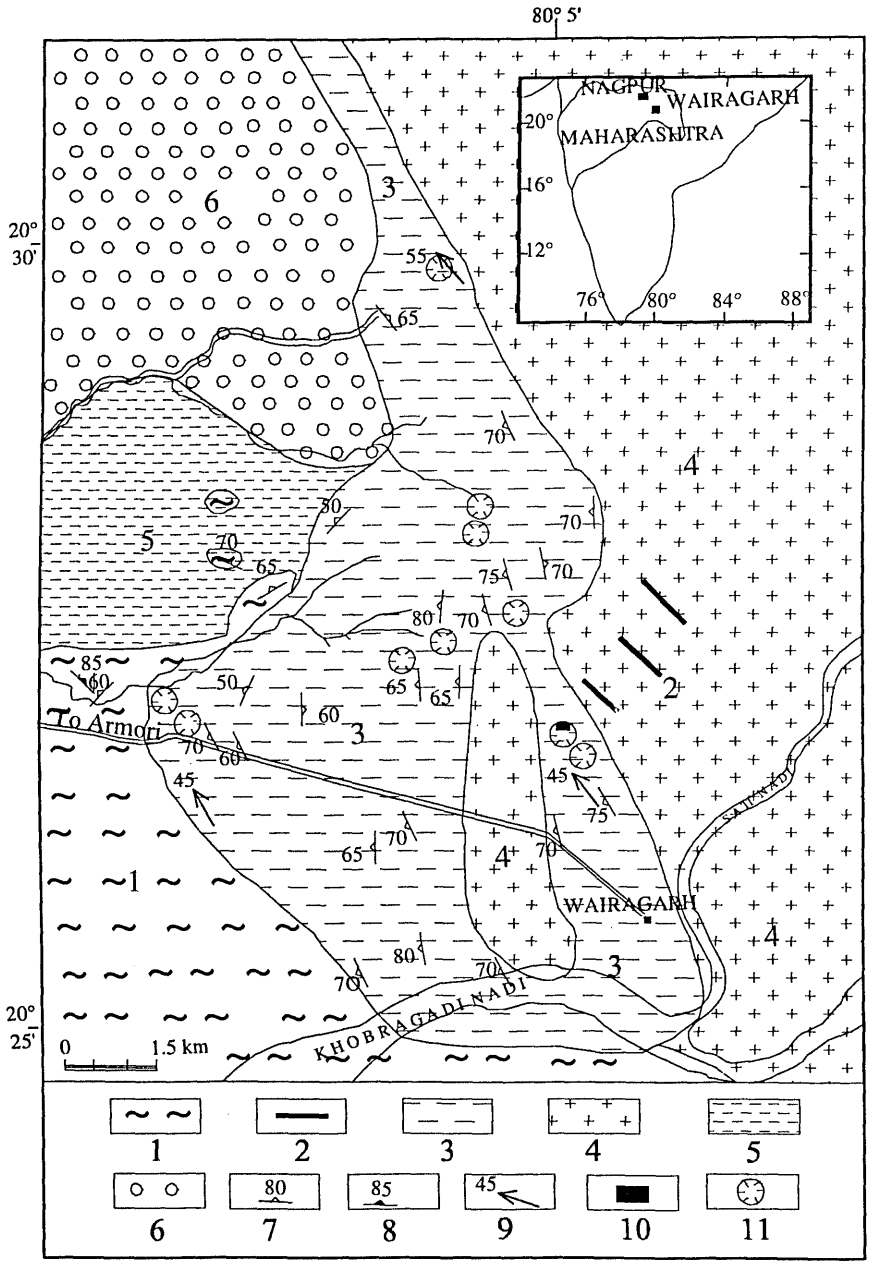

Fig 1. Geological map of Wairagarh area, Garhchiroli District, Maharashtra showing various rock types. *Symbols:* **1.** Amgaon Gneiss, **2.** Basic-ultrabasic dykes, **3.** Wairagarh metasediments, **4.** Dongargarh Granite, **5.** Pakhal sandstone, **6.** Gondwana sandstone and conglomerate, **7.** Attitude of mylonitic foliation, **8.** Attitude of crenulation cleavage, **9.** Plunge (amount and direction) of fold axis, **10.** Diamond sample location, **11.** Old workings. *Inset:* Location of Wairagarh

in the historic past. Presence of numerous dumps and some deep pits provide ample testimony to this. From the distribution of the old workings and abundant dumps, it can be assumed that the entire area was scanned for diamonds, including alluvium, colluvium, weathered bedrock and even the laterite profile developed over the conglomerate. It appears that the clast-rich portion was selectively mined, as a good crop of heavy minerals is associated with such coarse clastics. The workings, having a general size of 25 m - 40 m diameter, are seen spread throughout the area (Sahasrabudhe, 1971). Study of the old dumps and stacks suggest that the old miners have removed the clasts at the site of the pit itself and the matrix was crushed to ~1cm and ~5 mm size for recovery of diamond.

DIAMOND FIND

Due to paucity of exposures, the present study was

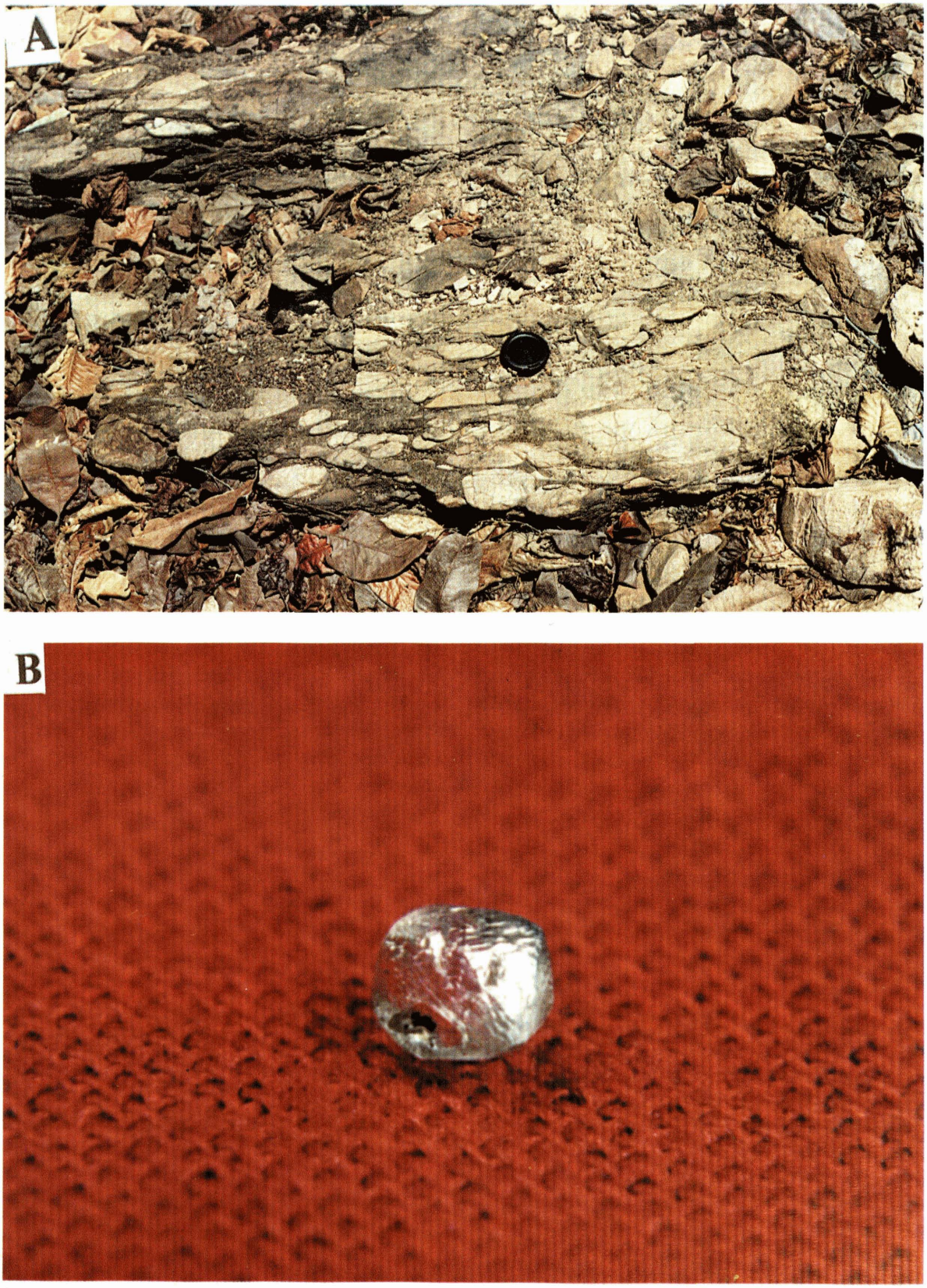

Fig.2. (A). Outcrop of Wairagarh conglomerate showing highly deformed clasts. **(B).** Octahedral gem quality diamond grain recovered from the conglomerate matrix (length 3.5 mm, breadth 2.5 mm).

confined to sampling of the left-over outcrops in the walls of old workings. Two bulk samples of one tonne each, from the matrix portion after removing the clasts, from two old working walls and another 0.25 tonnes of laterite sample were collected. These samples, after crushing to 5 mm size were tabled for heavies. Scanning of the heavy concentrates of the conglomerate matrix sample has yielded an octahedral gem quality diamond with typical adamantine lustre, showing well developed crystal faces (Fig 2 B). The diamond grain is 3.5mm long and 2.5mm wide (0.15 carat) with a slight degree of distortion. The specific gravity is determined to be 3.57. The tip of the octahedron is broken. A black coating seen on one face in a cavity appears to be graphite inclusion. The octahedral edges show stepped surfaces, probably as a result of etching or magmatic resorption.

On exposure to X-rays, the diamond shows bluish white fluorescence. A powder X-ray diffraction pattern of the crystal was obtained on 114.6mm Gondolfi Camera using Fe radiation with Mn filter at 40 KV and 20 mA. The observed sharp lines at 2.06 Å, 1.26 Å and 1.07 Å agree well with those for diamond (ICDS card no. 6-0675), indicating the crystal to be diamond.

The other heavy mineral assemblages present in the conglomerate include garnet (grossular, andradite almandine and high magnesium almandine or G5 garnet), chrome diopside, amphibole, ilmenite, staurolite, chromite and rare tourmaline. The Ca/(Ca+Mg) and Mg/(Mg+Fe) ratios of chrome pyroxenes do not show comparable chemistry to that of kimberlite/ lamproites. Similarly, the chromite grain also does not fall in the diamond inclusion field.

DISCUSSION

The Indian shield, like other cratonic areas of the globe, witnessed a major event of Kimberlite Clan Rock (KCR) magmatism around 1.1 Ga. A number of such bodies have been identified in the three cratonic areas viz. Dharwar, Bastar and Bundelkhand. In contrast to the eastern part of the Bastar craton, KCRs have not been identified so far in the WBC. The discovery of diamond in an older conglomerate of probable Palaeoproterozoic age points to a much older diamondiferous intrusion in to the Amgaon Gneiss. The source rock of diamond, probably of Archaean age, may be difficult to locate due to the complex geological processes the terrain has undergone, which include granite intrusion and regional metamorphism, followed by deposition of younger Proterozoic and Gondwana rocks.

Diamonds are also reported from metaconglomerate, quartzites and phyllite as old as 2.7 Ga, in Witwatersrand, South Africa. The Tarkwian, Ghana (*ca* 2 Ga), the Roraima, Venezuela (*ca.* 1.65 Ga), and Espinhaco, Brazil (Meso-proterozoic) also contain diamonds in greater or lesser extent (Nixon, 1995). The pebbly sandstone associated with the Cumbum Formation, Nallamalai Group in Andhra Pradesh, inferred to be Meso- to Neo proterozoic age, is known to be diamondiferous (Satyanarayana, 2000). In the WBC, though no kimberlitic rocks have been identified so far, the tectonic history and basement characteristics are conducive for emplacement of such rocks. The possibility of rocks other than kimberlites / lamproites being diamondiferous cannot be ruled out. A thorough examination of this aspect is necessary.

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