Suman Sahu SHREERAM, Singh SAHENDRA and Sankar Satapathy JYOTI, 2014. Genesis of Emerald Occurrences and Their Exploration Implications within Singhbhum Shear Zones, Eastern Indian Craton. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 1481-1482.

Genesis of Emerald Occurrences and Their Exploration Implications within Singhbhum Shear Zones, Eastern Indian Craton

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1 Introduction

Emerald, the green gem variety of beryl, is one of the most valuable gemstone after diamond and ruby. This gem variety is commonly hosted by pegmatite with or without schist at contact zone, schists without pegmatites and within veins and breccias of Black shales. (Abdalla *et al*., 1999).The green appearance of the crystal is due to the trace content of Cr and V, Which substitutes Al ions in small extent in the crystal lattice of beryl. The hue of green colour of emerald depends on the quantity of Cr and V present in the crystal (Grundmann *et al.,* 2008).The element Be is comparatively rare in the upper continental crust and specific geological and geochemical conditions are

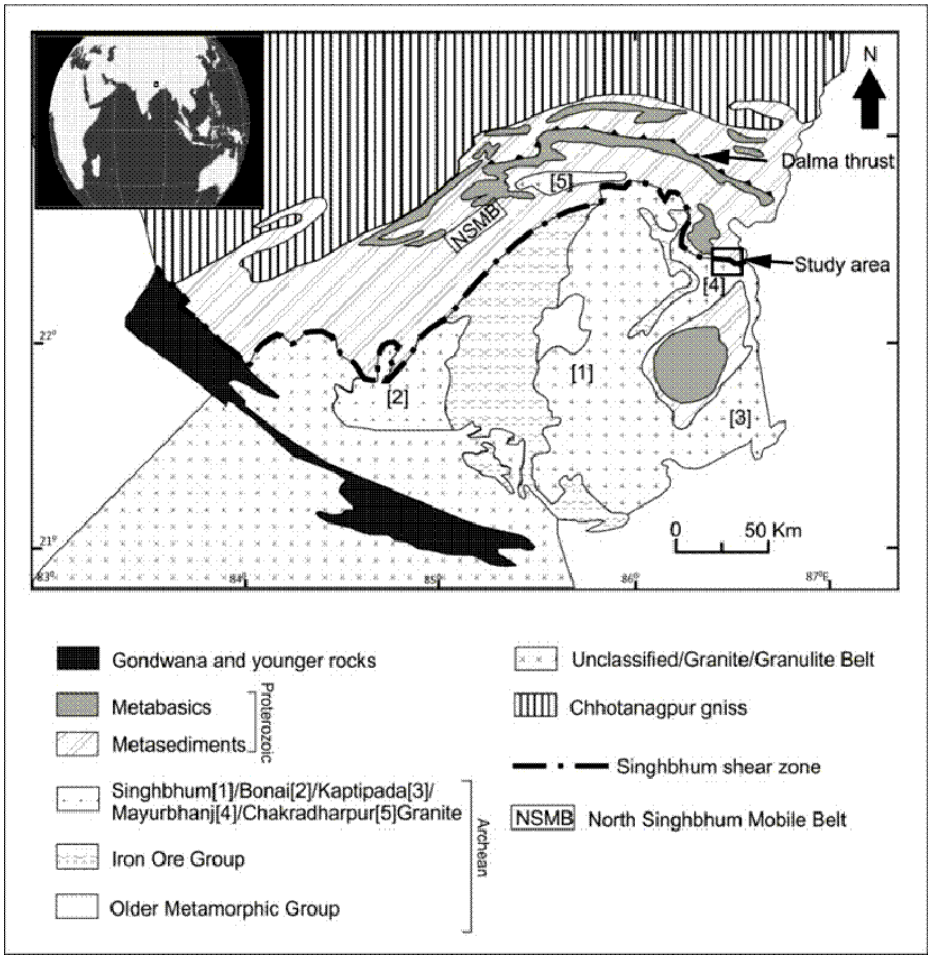

Fig.1. Regional Geological map of Singhbhum Orissa Craton

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required for Be, Cr and/or V to coalesce. The Singhbhum shear zone furnishes an ideal condition for emerald crystal growth where the Be bearing pegmatites interacts with Cr bearing mica schist or ultramafic.

2 Regional Geology

The Singhbhum crustal province occupy an area of approximately 50,000 km^2 and belongs to the eastern part of India. The broad geological framework of the Singhbhum Crustal province was carried out by Dunn (1937) and Dunn and Dey (1942). The central oval shaped Archean nucleus of this province is known as Singhbhum Orissa Craton (SOC) (Fig1.) (Misra, 2006). The crustal province has been subdivided into two northern and southern distinct provinces. Palaeo to meso-proterozoic northern younger province has been referred as North Singhbhum Mobile Belt (NSMB)(Fig1.) (Bhattacharya and Mahapatra, 2008). The southern crustal province consists of Iron Ore Group (IOG) and Archean granite–greenstone terrain or Singhbhum Granite Craton (Sengupta et al., 1997). The two provinces are separated by a sheared zone, known as Singhbhum Shear Zone (SSZ) (Fig1.), which extends over a strike length of more than 160 km (Mukhopadhayay et al., 1975; Saha, 1994; and Sengupta, et al., 2000). The shear zone shows multiple reactivations, the oldest one at ~3.09 Ga, followed by subsequent reactivation during Paleo and Mesoproterozoic periods (Misra and Johnson, 2005). The Singhbhum Granite being intrusive in to the former and forming the basement of the latter. In the Singhbhum terrain an oval shaped nucleus of Archean rocks is enveloped by Proterozoic rocks both to the north and to the south (Saha et al., 1988; Saha, 1994).

The Singhbhum shear zone provides an ideal condition for emerald crystal growth where the Be bearing pegmatite's interacts with Cr bearing mica schist or ultramafic. Our research work indicates that regional metamorphism and tectono-metamorphic processes during shear zone deformation might have played a significant role in the formation of emerald deposits. Different structures like joint, foliation plane, crenulations cleavage associated with shear zone may also have played an important role in mineralisation. In this paper we have reported new findings of emerald occurrences hosted by mica-schist near Godabanda village of east Singhbhum district, Jharkhand.

Acknowledgements

Shreeram Suman Sahu acknowledge the Fellowship provided by Director Indian School of Mines to carry out this work as a part of his PhD thesis.

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