

## **ROLE OF GOETHITE IN FIXING METALS FROM SOLUTION - A CASE STUDY FROM MOHARIYA, JAMUAL-MARKUNDI FAULT, SIDHI DISTRICT, MADHYA PRADESH, INDIA**

Madhuparna Roy<sup>1</sup>, D. Bhattacharya<sup>2</sup>, D. K. Mathur<sup>1</sup> and P. S. Parihar<sup>3</sup>

*Atomic Minerals Directorate for Exploration and Research,*

*<sup>1</sup>New Delhi, <sup>2</sup>Bangalore, <sup>3</sup>Hyderabad*

*E-mail: madhuparnaroy.amd@gov.in*

### **Abstract**

Ferruginous breccia at Mohariya, along the Jamual-Markundi Fault, Sidhi District, Madhya Pradesh, India, is marked by anomalously high metal content including uranium. The Jamual-Markundi Fault (JMF) marks the tectonic contact between the Early Proterozoic Mahakoshal Group and the Semri Group of the Vindhyan Supergroup, in Son-Valley area. The breccia within this fault zone, is laterally extensive and is marked by the presence of angular fragments of quartzite, quartz-goethite composite, phyllites and schist of variable size, embedded in a pervasive, ferruginous groundmass. Petrological study shows that goethite is the chief constituent of the groundmass of the breccia and Solid State Nuclear Track Detection technique indicated that radioactivity is associated with this groundmass. Trace element analysis of ferruginous breccia samples indicate high content of Ni, Co, Cu and U without the presence of any discrete Cu, Ni, Co or U bearing minerals. In-situ analysis of the ferruginous groundmass of uraniferous breccia samples by Electron Microprobe (EMP), shows high FeO (57.67-69.62 %FeO) and CuO (0.03 - 1.11 %) with upto 0.07 %CoO, 0.13 %NiO, 0.22 %UO<sub>2</sub> and 0.15 %ThO<sub>2</sub>, indicating clearly that these elements are present in the groundmass. Plots of Ni, Co, Cu, U, Th against Fe shows an irregular pattern implying variable concentrations within the ferruginous host. The association of uranium and other metals with ferruginous oxide/hydroxide is a commonly observed geological phenomenon. But the probable modes of such occurrence is not very well understood. It is popularly believed that these metals are held in substitution for Fe in the ferruginous mass. However, in the context of the present study and existing knowledge of the chemical behaviour of metals in iron oxide-hydroxide solution, it appears that there are several other ways in which metals remain associated with ferruginous matter. This paper explores the diverse causes for this usually observed association, in the backdrop of the case study from Mohariya, so that the basic mechanisms of metal fixation in ferruginous solution is understood.

**Keywords:** Ni, Co, Cu, U, Trace-elements.