Reporting a new type of magmatic Fe-Ti-oxide ore deposit in Chotanagpur Granite Gneiss Complex, East Indian Shield

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In general, magmatic Fe-Ti-oxide ore deposits are of two types, 1) mafic-ultramafic rock hosted layered deposits and 2) anorthosite hosted lensoid deposits [1]. The first type deposits consisting Ti-magnetite and ilmenite with occassional apatite, are hosted by either layered assemblages of gabbro-norite-pyroxinite-anorthosite or gabbro without ultramafic rocks. Whereas, the later type deposits containing Ti-magnetite, ilmenite and apatite, are discontinuous lens, vein and pod shaped bodies hosted by anorthosite-gabbro-norite-monzonite. The Chotanagpur Granite Gneiss Complex of the East Indian Shield contains some Fe-Ti-oxide ore deposits which are distinctly different in terms of mineralogy and mode of occurrence from the previously mentioned deposits. The massive lensoid ore bodies are hosted by gabbro-norite rocks and consist of Ti-magnetite, ilmenite and magnesio-hercynite cumulates. The morphology of these ore bodies are similar to the conventional second type deposits, but anorthosites are absent as host. Moreover, the complete absence of apatite and unusual presence of magnesio-hercynite spinel as major mineral in the cumulate mineralogical assemblage clearly indicate a different type of magmatic composition and its different history of generation in compared to other reported Fe-Ti-oxide ore deposits. Mineralogical compositions of the studied ore, obtained using LA-ICPMS analysis are compared with layered Fe-Ti deposit of Bushveld complex, South Africa [2] and anorthosite hosted lensoid Fe-Ti-oxide deposit of Damiao, China [3].The normalized trace element patterns of Ti-magnetites reveal that the Ti-magnetite of studied sample are almost similarly enriched in compatible elements (e.g. Cr, Ni and Co), but depleted in incompatible elements (e.g. Zr, Ta and Nb) compare to the other two deposits. The depletion of incompatible elements in Ti magnetite (major mineral phase) and presence of Mg-bearing phases (ilmenite and magnesio-hercynite) in mineral assemblage of studied deposits indicate a less fractionated melt relative to the other Fe-Ti-oxide deposits. Further geochemical studies are being done to model the genesis of this particular type of deposit.

[1]Tang (2017) Ore Geology Reviews 86, 79–99. [2]Dare (2014) Miner Deposita 49,785-796. [3] He (2016) Ore Geology Reviews 79, 367-381.