PETROCHEMISTRY OF DYKE ROCKS FROM THE PALEO-PROTEROZOIC MALANJKHAND PORPHYRY COPPER MINE, INDIA: A POSSIBLE LINK TO THE MINERALIZATION

C. E. Nehru^{1*} and D. B. Sikka²

¹ American Museum of Natural History, New York, NY 10024, USA

Brooklyn College, City University of New York, NY 11210, USA

² Cabinet Conseil en GeologieMiniere Sikka Enr., 2108, 3463 Rue Ste Famille, Montréal, Canada, H2X 2K7

* E-mail: Nehru@Brooklyn.CUNY.edu

Abstract

A detailed mineralogical, petrological, and geochemical (major, minor, trace and REE) study of the dyke swarms of the Malanjkhand Porphyry Copper Mine is presented and the potential link of these dykes to the copper mineralization was investigated. Field relationships and subtle differences in dyke chemistry suggest minimum three episodes of dyke intrusion. Dykes intrude tensional joints in the granitic rocks that host the Malanjkh and copper deposit. Radial dyke centers were also observed. Gabbros, pyroxenites, amphibolites and schlieren of amphibolites in granitic body, are also present. The older Malanjkhand granitic rocks are of calcalkaline affinity. Younger dolerite dykes are tholeitic. Hydrothermal alteration is pervasive but did not affect the chondrite-normalized trace element and REE profiles of dyke rocks. Mylonitization had no effect on the chemistry. Gabbros and pyroxenites outcrop north of the mine pit. The amphibolite dykes, although similar in major element chemistry, are not related to the basaltic dykes. Ratios involving Zr, Ni, Y, and Ti in the Malanjkhand dyke samples are similar. However, they differ from the gabbro, pyroxenite and amphibolite. Major and minor element trends provide little evidence of differentiation in the dykes. Malanjkhand dykes are Ti-rich and the ilmenite has an unusually high Mn content suggestive of a relationship to diamond bearing kimberlitic rocks. Copper and iron sulfide minerals in the dykes suggest that the timing of mineralization and the emplacement of dykes and their hydrothermal alteration in general may have been nearly synchronous. The possibility of the relationship between the dyke magma and the granitic host rocks to the copper mineralization is considered. Dykes with small amounts of sulfide mineralization may be used as a prospecting tool.

Keywords: Malanjkhand dykes, Geochemistry, Relation to Cu mineralization; Origin