MICROSTRUCTURE ANALYSIS OF MACHANUR GRANITE, EASTERN DHARWAR CRATON: UNDERSTANDING DEFORMATION MECHANISM AND CONTROLS OF CU MINERALIZATION

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Abstract

A wide range of deformation-related textures have been identified by detailed mapping and petrographic studies in Machanur granite which hosts disseminated and vein-type copper mineralization. The Machanur granite is a K-feldspar porphyritic, hornblende-granite of Neoarchean age in Eastern Dharwar Craton. The granite around Machanur village in Raichur district of North Karnataka shows several ENE-WSW zones of brecciation, hydrothermal alteration and sulphide mineralization. Pyrite-chalcopyrite dominant sulphide mineralization is hosted by a major ENE-WSW trending breccia zone within the granite and the intrusive dolerite dyke. Evidence of hydrothermal alteration is in the form of quartz, carbonate, hematite, epidote and chlorite veins traversing the brecciated granite. Detailed mapping in the area has delineated a major ENE-WSW trending brittle-deformation zone extending along strike for several kilometers with widths ranging from 50 to 150m. This deformation zone is characterized by brecciated granite which has also undergone hydrothermal alteration and hosts sulphide mineralization. The breccia zone in granite shows the presence of angular and polygonal granite clasts embedded in the highly altered and crushed granitic matrix. Petrographic studies have shown that quartz and feldspar in the granite exhibit characteristic textures related to brittle deformation with a range of cataclasite textures ranging from protocataclasite to orthocataclasite. Minerals in the granite particularly quartz and feldspar have responded to deformation by micro-cracking, development of polygonal subgrains and subsequent recrystallization. Quartz and feldspar grains in the granite show micro-deformation fabrics including strain, fracturing and recrystallization. Based on the presence of typical cataclasite textures coupled with the absence of mylonite, it is suggested that Machnur granite has undergone predominantly brittle deformation at shallow-levels within the upper crust. The brittle deformation zones containing fractures networks, joints and breccia-matrix have provided enhanced permeability for channelizing hydrothermal fluid flow causing profuse alteration and precipitation of sulphides.

Keywords: hydrothermal alteration, breccia zone, cataclasite, sulphide mineralization