Characterization of geochemical alteration halo associated with gold mineralization at the Buzwagi mine, northern Tanzania

Shukrani Manya

Abstract

Alteration halo geochemical study was carried out along one transect at the Buzwagi mine which is found in the Neoarchaean Nzega greenstone belt of northern Tanzania. The Buzwagi mine Au mineralization is hosted in quartz veins that are cross-cutting strongly sheared and hydrothermally altered K-granites. Mineralogical studies within the shear zone reveal that sericite, silica and sulphides are the most important hydrothermal mineral assemblages responsible for Au mineralization at the Buzwagi mine. The geochemical alteration halo is characterized by the addition of Au, Cu, Fe, K, Rb, Sn, W and U to wall rocks and simultaneous removal of Na, Sr, Ba, LREE and MREE from the host rocks. The concentrations of Cu (130–870 ppm) which show strong positive correlation with Au ($R2 = 0.99$) are so high in the alteration halo indicating that Cu is a strong Au pathfinder at the Buzwagi mine. Owing to their immobility during the post-emplacement processes, the HFSE (Zr, Hf, Th, Ta) remained unchanged during the hydrothermal alteration process.

The addition of Fe and Cu is attributed to the presence of Fe- and Cu-sulphides (pyrite, chalcopyrite and chalcocite) whereas the addition of K, Rb, Sn, W and U is a function of both primary concentrations of these elements in the host rocks as well as the subsequent strong hydrothermal alteration evidenced by sericitization and silicification which involved the destruction of feldspars into sericites). The destruction of albite and its replacement by sericite accounts for the depletion of Na, Sr (and Ba). The Buzwagi mine Au mineralization mineral association do not include the more known pathfinders like Ag, As, Sb, Bi, Te and Tl and they seem not to have played a role in the mineralization process. These elements, therefore, should not be considered as pathfinders for Au exploration purposes at a Buzwagi-like deposit.