Abstract

The Nsuta manganese deposit is located in the Western Region of Ghana, approximately five kilometers south of Tarkwa Goldfields. The deposit has been an important source of manganese ore since mining began in 1916. The purpose of this project was to produce a concise model of the stratigraphy, sedimentology and structural evolution of the deposit in support of future exploration projects.

The manganese ores occur as an up to 45m thick carbonate bed in a thick turbidite-greenstone succession that is part of the ~2.2 Ga Birimian Supergroup. Calc-alkaline volcanics, volcaniclastics, turbidites, argillites and phyllites are thought to have been deposited in a backarc basin environment. The entire sedimentary succession, including the manganese orebody, is a thick turbidite package hosted between an upper and lower greenstone unit consisting predominantly of volcaniclastic material.

The entire lithological succession at Nsuta is interpreted to have been deposited within the middle to lower reaches of a submarine fan environment. Field evidence suggests a simple stratigraphy, commencing with a lower greenstone unit composed largely of volcaniclastic material. This is followed by an upward-fining lower turbidite unit deposited in response to a marked transgression and sea level rise. Maximum rate of sea level rise provided ideal conditions for manganese precipitation and concentration, as detrital influx ceased. The central portion of the carbonate orebody that formed hosts the manganese orebody.

An upward-coarsening turbidite unit follows above the carbonate unit. This upward-coarsening succession reflects a regression and a highstand systems tract in terms of sequence stratigraphic principles. It is capped by an unconformity that formed during a period of rapid relative sea level fall. It is overlain by a second upward-fining turbidite succession. This succession is not fully preserved as there is a sheared contact between it and the overlying upper greenstone unit.

Post-depositional deformation and metamorphic alteration are largely attributed to the Paleoproterozoic Eburnean Orogeny. A first phase of compression was directed along a NW-SE axis and produced a series of isoclinal anticlines and synclines (F_1) with NE-SW striking axial planes. This was followed by thrusting between the anticlines and synclines. The age of this deformation and closely associated greenschist metamorphism can be accurately constrained between 2.09 Ga and 2.07 Ga.

E-W oriented oblique listric faulting has a prominent effect on the appearance of the Nsuta manganese deposit, as it produced a series of imbricate fault blocks dipping to the north. Associated with this period of deformation is small-scale cross folding with axes plunging to the east (F_2). The faults post-date the Eburnean Orogeny and must be associated with a second major tectonic event. Finally, a NNE-SSW striking normal fault, locally known as the German Line, caused further block rotation, notably in the northern parts of the mining concession.

Late Mesozoic deep lateritic weathering and incision of the lateritic peneplane by modern rivers have resulted in the complex dissected appearance of the Nsuta orebody. However, based on the detailed structural analysis provided in this study, a feasible target for future exploration of manganese ore buried beneath Late Mesozoic and Cenozoic sediments and soils, has been identified. This target is located to the west of Hills A and B.