

# **Towards a new model for the origin of giant Palaeoproterozoic sedimentary manganese deposits: evidence from mineralogy and geochemistry of the Nsuta manganese deposit, Ghana.**

Frank K. NYAME, Department of Geology, Rand Afrikaans University, P. O. Box 524, Auckland Park 2006, Johannesburg, South Africa.

## **Abstract**

The origin of sedimentary manganese carbonate deposits has been the subject of intense research by several workers due, in part, to manganese being a potential candidate for palaeo-environmental reconstruction, i.e. evolution of hydrosphere, biosphere and atmosphere. Mn mineralization within a given deposit must necessarily have involved a cycle of source, transportation and deposition, all of which have received exhaustive but often-inconclusive treatment in literature.

One striking similarity among the diverse classifications or genetic models is that none satisfactorily fits the litho-geochemical observations commonly made in these deposits, i.e.

(i) Spatial separation of clastic or carbonate-dominated host rocks from chemically precipitated manganese ores within the same basin

(ii) Highly pyritic/Fe-rich rocks (also BIF) in clastic-dominated lithologies (shelves?) edging Mn deposits

(iii) Ubiquitous presence of microconcretionary carbonates around orebody margins, most with non-equilibrium textures and/or compositions, as opposed to micritic and equilibrium-precipitated carbonates in ore zones

(iv) Mixed carbonates and/or kutnahorite distributed around rhodochrosite orebodies as constantly revealed in stratigraphic sequences

(vi) Strong correlation between negative  $\delta^{13}\text{C}$  values and Mn enrichment

(vii) Consistently higher REE contents in host rocks relative to carbonate ores

(viii) Heavy carbon and often light sulphur isotope signatures in host rocks versus opposite trends in ore zone

(ix) Increased Corg contents in host rocks relative to ores

Based on studies from the Nsuta Manganese deposit, Western Ghana, an attempt is made to highlight the need for an alternative model (1) commensurate with observed litho-geochemical characteristics and (2) as an exploration tool in the search for new deposits.