
Metamorphic petrology and U/Pb geochronology of the Otjosundu area, southern central zone, Damara belt, Namibia: an alternative way to understand a world-class manganese deposit.

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Résumé

The Otjosundu area contains one of the most important Mn deposit of Namibia. In 2008-2009, an exploration campaign acquired a huge dataset including fieldwork, drillholes, geophysics and petrological data improving the knowledge of the deposit. The geological history is however, still studied and the deposit is classically attributed to banded iron formation of the Sturtian Chuos formation from the Damara sequence, based on lithostratigraphic comparison.

Using samples from drillholes, we here provide PTt constrain using thermodynamic modelling and LA-ICP-MS U/P ages on zircon, monazite and apatite to decipher the regional metamorphic evolution. Our petrological study concludes that the Otjosundu Mn deposit is affected by a HT-MP metamorphic event, estimated at ~670°C and 0.6 Gpa in the paragneisses. This HT-MP metamorphism is associated to a strong ductile deformation with development of shear zones, and multiple-scale intense folding. These metamorphic and structural features totally preclude the description of a typical sedimentary sequence, on which the previous authors had based their classical lithostratigraphic comparison. We date this HT metamorphic event at ca.525Ma using U/Pb ages on monazite in paragneisses and in a granite, and U/Pb ages on zircon in a granite.

Detrital U/Pb ages on zircon reveal that the maximum deposition age is at ca. 540Ma. This excludes the attribution of the gneisses surrounding the Mn deposit to the Sturtian Chuos Formation. Detrital U/Pb ages on zircon also register older magmatic events at ca. 620 and 585 Ma that are well known regionally, but were not described in the Otjosundu area. Finally, U/Pb ages on apatite (490+/-3Ma) highlight a late thermal event (hydrothermal or static metamorphism). Results of this study illustrates the importance of characterizing the entire geological history of an ore deposit, to improve the future exploration.

Mots-Clés: Metamorphic petrology, geochronology, Damara belt, Manganese ore deposit

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