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Iron deposits in Africa (including Banded Iron Formation)

Introduction

Iron deposits are natural concentrations of iron rich minerals (e.g. hematite, magnetite, goethite etc.) formed in marine or marginal marine environments through chemical sedimentation and are extracted at a profit depending on the degree of concentration and locality. This paper will be focusing on iron deposits in Africa, these incorporate bog ores, ironstone and mainly Banded Iron Formations. Consideration of the origin and formation, distribution, economic significance and usesof Iron ores will help support our discussion

Origin and formation

The chemical processes by which ore concentrations are form complex and controlled by parameters such as oxidation-reduction and pH, as well as climate, paleolatitude, and biological-atmospheric evolution (Robb, 2005).Ore types stated in the introduction can be differentiated using the mineralogical, textural and morphological considerations. These ore types can illustrate different types of ore forming processes.

*Bog iron deposits*are typically small,thin and comprise of concentrations of goethites and limonites which are iron oxyhydroxides, these ores are associated with organic-rich shales. They are formed by the alteration of silicates, sulphides and other minerals in an oxidizing environment, where hardly any iron goes into the solution in the Fe^{2+} form or where the solution is too acidic (Mel'nik, 1982).

Ironstone deposits are Phanerozoic in age, they were formed in shallow marine and deltaic environments and typically consist of goethites and hematites that have been rolled into oolites or pellets, suggesting the action of mechanical abrasion, these deposits contain little or no chert, but commonly associated with iron-rich silicate minerals such as glauconite and chamosite (Robb, 2005).

*Banded Iron Formation (BIF) deposits*are chemically precipitated sediments, typically thin bedded or laminated, composed of alternating layers of chert, chalcedony, jasper or quartz. They are Precambrian in age. The Iron content in BIF is in the range of 20% to 35% and the silica content is in the range of 40% to 50% (James, 1983).BIF's re classed into two types; the first is the Algoma type which is associated with volcanics, the second is the Superior type which is deposited near-shore continental shelf environment in association with dolomite, quartzite and black shales .Accordingly, BIFs precipitated in huge lakes of warm hydrothermal solutions undergoing intensive evaporation and mineral concentration in the freezing-cold Polar Regions. As a result of half a year of illumination, cyanobacteria oxygenic photosynthesis deposited iron oxides with silica (geyserite) followed by a lamina of silica only, forming recurrent annual varves. Diamictites on top of BIF successions in Western Australia and South Africa accumulated from melting glaciers when the plates shifted to lower latitudes, as corroborated by paleomagnetic high-latitude paleo-positions (Lewy, 2009)

Distribution

Iron ores deposits are found throughout the African continent, let us consider Banded iron formations as they are the most abundant in our continent according Robb (2005). The current largest ore deposit is in Sierra Leon. Some major iron deposits are found in Nimba in Liberia, Penge, Griqualand and the Kaapvaal in South Africa. Focusing on South Africa, the main iron ore producing areas are Sishen in the Northern Cape which has an estimated ore reserve of 4200Mt, Thabazimbi in the Limpopo province with an estimated ore reserve of 100Mt, the Maremane Dome which is also the Limpopo province and the Bushveld complex in the

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Mpumalanga province.The iron-formations of the Transvaal-Griquatown belts of South Africa (Kuruman Iron Formation in the Griquatown belt of Northern Cape Province and Penge Iron Formation of Transvaal) occur in the lower part of the Transvaal Supergroup, overlying thick dolomite (Beukes, 1973). The total length of outcrop, including the gap between the north end of the Griquatown belt and the Transvaal Basin, is about 1200 km. The iron-formation units range in thickness up to 300 m.

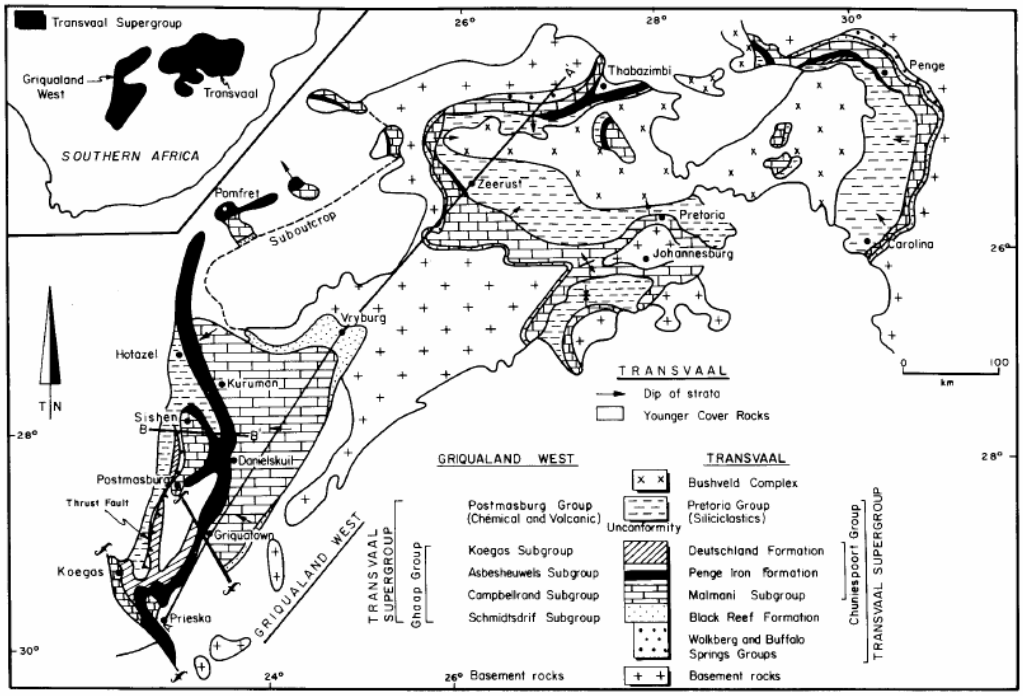

Fig. 4-1. Distribution and gross stratigraphic subdivision of the Transvaal Supergroup in the structural basins of Griqualand West and Transvaal (Section lines AA' and BB' refer to Fig. 4-4B and 4-4C, respectively).

Economic significance and use

Iron ore deposits can be found, although in relatively small quantities, in many African countries: Tunisia, Morocco and Egypt north of the Sahara, Niger, Nigeria, Mozambique, Swaziland and Tanzania to the south. South Africa, with a third of actual resources, and Liberia, Libya, Mauritania and Algeria appear as the main iron ore countries. Moreover, potential resources, though unconfirmed, are quite considerable for some countries, such as Namibia and Zaire, which now hold a rather modest position. Theoretically this relatively wide dispersal of present and future reserves could put Africa in a stronger position for iron ore than for the other minerals in the world geopolitics. Credit Suisse Commodities iron ore manager Phillip Killicoat (2010) not in the reference list! addressed an African Iron ore conference in Cape Town stating that “Africa may turn into a major iron ore exporter after the year 2020. The market for iron ore, used in stainless steel production, is the second biggest commodity trading market in the world, valued at some $150 Billion. Africa accounts for about 2% of this amount, although it holds 20% of the world’s resources”

Conclusion

Iron deposits play such a significant role in our world, we use iron (not in its raw form) daily without taking note as to where, how and when it was formed. Iron affects our daily lives, from the spoon we use to eat with

to the pillars in buildings, we have been made more aware of the significance of iron from a social, economic and geological perspective. With regard to the geological perspective, iron formation is a quite interesting phenomenon in terms of how it incorporates volcanic and sedimentary components to be fully developed. In conclusion,

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