Economic Geology
Vol. 95, 2000, pp. 607-620

Sedimentary Origin of the Mn-Fe Ore of Um Bogma, Southwest Sinai: Geochemical and Paleomagnetic Evidence

N. L. ELAGAMI,
Nuclear Materials Authority, P.O. Box 530, Maadi, Cairo, Egypt

E. H. IBRAHIM,
Department of Geology, Faculty of Science, Mansoura University, Mansoura, Egypt 35516

AND H. H. ODAH
National Institute of Astronomy and Geophysics, Helwan, Egypt

Abstract

Paleomagnetic, mineralogical, and geochemical investigations have been carried out to estimate the origin and age of the Mn-Fe ore of Um Bogma Formation of the early Carboniferous. For this purpose, oriented samples were collected from 26 sites in the Mn-Fe ore and host rocks of Um Bogma Formation and the overlying sandstone of Abu Thora Formation. The paleomagnetic pole, determined from the characteristic remanent magnetization of the Mn-Fe ore from 20 sites and the hosting rocks of Um Bogma Formation, is located at 22° S, 97° E (Dp = 3.9°, Dm = 7.4°). This paleomagnetic pole position falls close to the Carboniferous poles of Africa, suggesting that the Mn-Fe ore and associated rocks of Um Bogma Formation were deposited during the Carboniferous. Furthermore, the paleolatitude determined for these rocks, based on the mean paleomagnetic inclination, suggests that the Mn-Fe ore of Um Bogma was deposited at a latitude 10° south of the equator, i.e., in tropical conditions. Mineralogical and geochemical investigations support the paleomagnetic results. The ore is enriched with Na, K, Ca, Mg, Sr, Co, and Ni, suggesting that the Mn-Fe ore of Um Bogma is of sedimentary marine origin. The enrichment of some ore samples with hydrothermal elements (As, Zn, Cu, Pb, V, W, and F) is restricted to faulted areas, indicating that a younger phase of hydrothermal activity affected the ore after its deposition.

Samples from the overlying Abu Thora sandstone yield a mean palaeomagnetic direction of D = 326°, I = 42°, k = 19.3; $\propto_{95}$ = 17.9°, which provides a palaeomagnetic pole position at latitude 59°, longitude 302° (Dp = 13.5°, Dm = 22°). This magnetization is significantly different from that of the Mn-Fe ore and host rocks and is assigned a Cretaceous age. The porous sandstone acquired its magnetization long after deposition, most likely by diagenetic chemical processes associated with red pigmentation.