

Table S1 (supplementary). Chemical composition, types, and sedimentary facies of the Mn-Fe ore deposit of the Um Bogma area, west-central Sinai, Egypt.

Ccomposition & charaacters	Wadi El Shallal [#]	Wadi Abu Thora [#]	Gebel Um Bogma [#]	Wadi El Sahu [#]
Mn %	32.92	42.06	25.95	19.67
Fe %	12.17	21.05	26.65	27.77
Mn/Fe ratio	2.71	2.0	0.97	0.71
Cu (ppm)	410	440	1450	762
Pb (ppm)	220	385	450	375
Zn (ppm)	380	430	410	1298
Ni (ppm)	200	250	240	328
Co (ppm)	213	210	260	268
Cr (ppm)	65	45	55	157
Ore type*	Pyrolusite & Psilomelane-hematite types		Pyrolusite-hematite type	
Sedimentary facies**	Shallow marine to lagoonal facies			Continental facies

Chemical composition of the Mn-Fe ore of Um Bogma from El Agami et al. (2000)

* Mn-Fe ore types of Um Bogma as classified by Magaritz and Brenner (1979)

** Sedimentary facies of Mn-Fe ore of Um Bogma after El Aref et al. (2020)

Table S2 (supplementary): Microprobe analysis of manganese minerals from the Mn-Fe ore of Um Bogma, west-central Sinai.

Oxides (Wt.%)	Pyrolusite mean (n = 8)	Manganite mean (n = 4)	Psilomelane mean (n=4)	Cryptomelane mean (n = 8)	Chalcophanite mean (n = 6)	Hausmanite mean (n = 8)
Na ₂ O	0.36	0.14	0.10	0.92	0.52	---
MgO	0.07	0.02	0.06	0.23	3.30	0.33
Al ₂ O ₃	0.32	0.48	0.30	0.61	0.55	1.37
MnO ₂	95.13	87.14	86.99	90.48	80.43	74.80
SiO ₂	0.36	0.21	0.46	0.36	0.91	1.25
ZnO	0.35	0.27	0.05	0.27	1.54	0.33
BaO	0.05	0.05	6.47	0.03	0.38	---
K ₂ O	0.32	0.00	0.13	1.73	0.86	---
CaO	0.25	0.55	0.30	0.76	0.55	0.38
FeO	1.09	1.18	0.66	1.72	0.24	20.27
CoO	0.05	0.04	0.02	0.03	0.03	0.02
Cr ₂ O ₃	---	0.03	0.03	0.05	0.06	0.04
Total	98.35	90.08	95.52	97.13	89.28	98.75

Table S3 (supplementary): Pearson correlation coefficients between the selected trace elements in the stream sediments of the west-central Sinai district.

	Mn	Fe	Cu	Pb	Zn	Cd	Cr	Co
Mn	1.0							
Fe	-.177	1.0						
Cu	.587	-.021	1.0					
Pb	.355	-.129	.240	1.0				
Zn	.570	.187	.605	.371	1.0			
Cd	.245	.017	.020	.306	.396	1.0		
Cr	-.382	.498	-.273	-.338	-.121	-.214	1.0	
Co	.393	.242	.518	.411	.454	-.013	-.098	1.0