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Origin of the Divriği A-B Kafa Iron Deposits Based on Magnetite Main-Trace Element and Stable Isotope ($\delta^{18}O$, $\delta^{56}Fe$) Geochemistry, Sivas Türkiye

HANDE ERMAN SARIGÖL[1], ÇIĞDEM ŞAHIN DEMIR[2], **ALI - UÇURUM**[2], RYAN MATHUR[3] AND MICHELLE GEVEDON[4]

[1]Erzincan Binali Yıldırım University
[2]Sivas Cumhuriyet University
[3]Geology Department, Juniata College, 1700 Moore Street, Huntingdon, PA 16652
[4]University of Texas at Austin

Presenting Author: aliucurum@cumhuriyet.edu.tr

The Divrigi iron deposits were defined as A and B Kafa deposits, known as the largest high-grade open-pit iron ores in Turkiye, and located about 100 km southeast of Sivas province in Central Anatolia. A Kafa hosted at a triple junction between Upper Cretaceous-Paleocene syenitic-monzonite, Mesozoic dolomitic limestone, and Upper Cretaceous serpentinized ultramafic rocks. However, B Kafa is located at tectonic contact among Mesozoic dolomitic limestone and Upper Cretaceous serpentinized ultramafic rocks. Since the discovery of iron at the Divrigi in 1940 during railroad infrastructure, approximately one million tons of ore have been mined annually.

We have sampled both A and B Kafa iron deposits, magnetite has been separated for geochemical analysis. Thirty magnetite separates have been analyzed for oxides and main-trace elements.

Based on magnetite discrimination diagrams Ti (ppm) - Ni/Cr (ppm); V (ppm) - Ti (ppm); Al+Mn (ppm) - Ti+V (ppm); and Co+Ni (ppm) - Ti+Al+V (ppm), magnetite from Divrigi A and B Kafa iron deposits formed by hydrothermal processes instead of magmatic one.

According to Ca+Al+Mn (wt %) vs. Ti+V (wt %) and Ni/(Cr+Mn) vs. Ti+V (wt %) diagrams Divrigi A-B Kafa magnetite samples mainly plotted as skarn with some exceptions.

The ^{18}O (n=20) and ^{56}Fe (n=21) values of magnetite from Divrigi A-B Kafa iron deposits range from 1,7 to 7,6 ‰ and -1,06 to 0,32 ‰ respectively. Our New O and Fe stable isotope ratios are reported for magnetite samples from Divrigi A-B Kafa iron deposits and these results shed light on the origin of other Central Anatolian iron deposits.

This ^{18}O and the ^{56}Fe values may suggest that meteoric fluids or basinal brines were not in the formation of the deposits. Our ^{18}O and ^{56}Fe data for Divrigi A-B Kafa iron deposits-with lack of apatite- are consistent with Pilot Knob magnetite-apatite, southeast Missouri, USA with a combination of magmatic and magmatic-hydrothermal growth of magnetite, and with the magnetite-fluid flotation model proposed by Knipping et al (2015) for Kiruna-type iron oxide–apatite (IOA) deposit.

Reference:

Knipping, J. L. et al, 2015, Giant Kiruna-type deposits form by efficient flotation of magmatic magnetite suspensions. Geology, v. 43, p. 591–594.