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Origin of gypsum formations in copper deposit of Murgul, NE Turkey

Ali Sait Çol[a], Nevzat Özgür[a,1], Tuğba Arife Çalışkan[a]

[a]*Suleyman Demirel University ,Faculty of Engineering, Department of Geological Engineering, 32260 Isparta, Turkey*

Abstract

The Anayatak and Çakmakkaya orebodies forming the Cu deposit of Murgul in the East Pontic metallotect, NE Turkey were completed before supergene alteration and erosion occurring in short periods of time under subaerial conditions in the area. Furthermore, pyroclastics and sediments (up to 10 m) in the Cu deposit of Murgul represent the short time interval as marker bed. It is an important element for the terrestrial conditions dominated in the area. The local identifier marker bed with ore under atmospheric conditions at the surface, sedimentation dacitic pyroclastics and alteration is interpreted as the result of the erosion events. Gypsum formations located on the upper level of the formerly existing Bognari orebody refer to a brecciated bearing mineralization formed under atmospheric conditions. In this last case gypsum formations can indicate an environment by oxidation of sulfide minerals associated with atmospheric conditions, unlike some of the research results. In Çakmakkaya orebody, gypsum minerals found in altered dacitic pyroclastics are genetically different from above described gypsum minerals. The origin of gypsum minerals can be attributed to seawater sulfates reduced by Fe-oxide/-hydroxide phases. Gypsum minerals in pyroclastics of Anayatak and Çakmakkaya orebodies are not related to host rocks ore mineral assemblage and must be considered as prior to sulfide mineral assemblage. Later on, investigation area exposed to tectonic uplift and subsequent Cu deposit of Murgul formed under terrestrial conditions.

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Keywords: East Pontic metallotect; Cu deposit of Murgul; gypsum minerals; genesis of Cu deposit

1. Introduction

Massive sulfide deposits in the East Pontic metallotect, NE Turkey, which extends over an area of more than 350 km E-W and 60 km N-S, are associated with altered 150 to 300 m thick dacitic pyroclastic host rocks in Senonian.

* Corresponding author.
E-mail address: nevzatozgur@sdu.edu.tr

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Age[1,2]. In the area, the important base metal deposits change along the general strike from east (Cu>>Pb+Zn; type Murgul) to west (Pb+Zn>>Cu; type Madenköy and Lahanos)[3] (Fig. 1). Genetically, Cu deposit of Murgul and other massive sulfide deposits in the east of the metallotect can be classified to the subvolcanic-hydrothermal type with a Senonian island arc volcanism under predominant subaerial conditions and represent a transition between Kuroko type deposits and copper porphyries. In comparison, the Cu deposits of Madenköy and Lahanos in the west are related to a submarine-hydrothermal activity in a volcano-sedimentary sequence under temporally subaquatic conditions. In Cu deposit of Murgul, the mineralization is hosted in dacitic pyroclastics with a thickness up to 300 m. These pyoclastic host rocks in the study area are overlain by a 20-50 m thick formation cosnsisting of pyroclastics, sandstones and limestones which is overlain by 500 m thick barren dacitic lava flows. The gypsum minerals in the above mentioned 20-50 m thick formation, which must have been formed under subaerial conditions, might be generated with respect to the oxidation of sulfide minerals in the ınvestigation area respectively. A few researchers such as[4,5] assume that Cu deposit of Murgul can be assigned to a submarine-hydrothermal origin under subaquatic conditions with respect to the results of $\delta^{34}S$ analyses. Therefore, the aim of this research is to elucidate the origin of gypsum minerals in the sequence consisting of pyroclastics, sandstones and limestones due the results of $\delta^{34}S$.

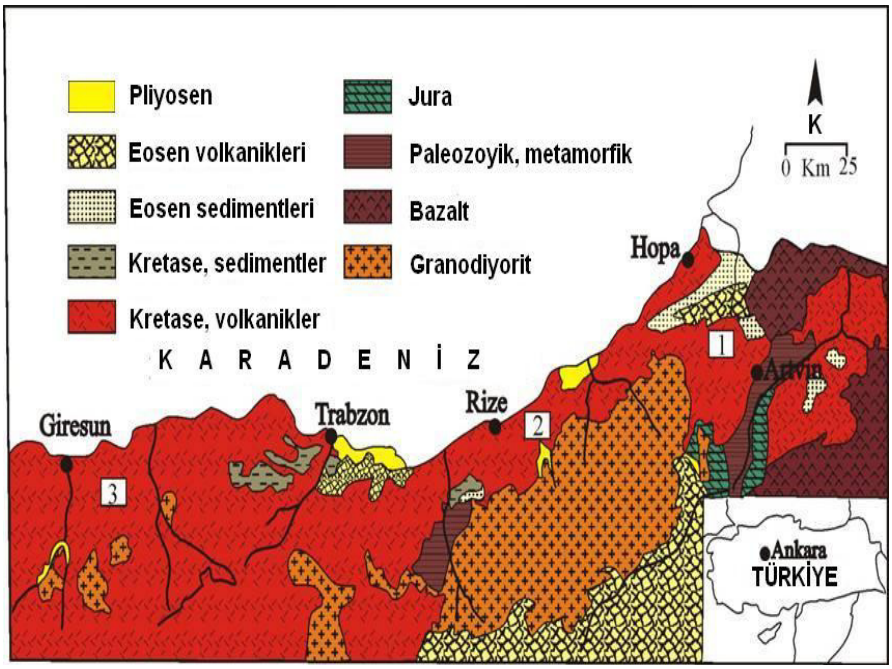

Fig. 1. Geological sketch map of the East Pontic metallotect, NE Turkey and important massıve sulfide deposits: 1: Murgul, 2: Madenköy, 3: Lahanos[6,10].

2. Geologic Setting

The Cu deposit of Murgul occurs within the upper part of the first volcanic cycle and is associated with a 150 to 300 m thick group of felsic pyroclastic rocks whose upper contact is marked by a thin layer of marine sediments, and is characterized by intense erosion and weathering[6]. The pyroclastic host rocks can be classified into Senonian age according to paleontological observation[7] and overlain by interbedded pyroclastic tuffs, sandstones and limestones, and by 200 to 500 m thick barren dacitic lava flows. The pyroclastic host rocks consist of altered breccias and tuffs. The primary minerals in the altered host rocks can be observed only as relicts. In the less altered host rocks, the fluidal groundmass contains phenocrysts of plagioclases (An_{28-35}) and quartz and plagioclase microlites (An_{12-30}), relicts of hornblendes and biotites, and minor quantites of apatites, sphenes and haematites[2].