Paper Number: 5115

The Study on the Mechanism for Weak Anomaly Spectral Response of Porphyry Copper Mineralization Alteration

Zhifang Zhao, Weihua Zhang, Qichen, Jieru Yan

School of Resource Environment and Earth Sciences, Yunnan University, Kunming, China, 650011,zzf_1002@163.com

Mineralization alteration is an important porphyry copper prospecting sign. The research on the weak anomaly spectral response mechanism for the porphyry copper mineralization alteration, especially in hard condition area, could be very helpful to the prospecting exploration by effective application of remote sensing technology[1][2].

This paper selects Pulang porphyry copper mining area in Northwestern Yunnan, China as the study area. In view of the porphyry copper mineralization which has potassic, silicification, sericitization, propylitization mineralization alteration zones from the inner to the outside of the rock, with the corresponding alteration minerals such as biotite, quartz - quartz , sericite - chlorite, epidote, kaolinite and montmorillonite, saussurite , the mechanism of the weak anomaly spectral response for porphyry copper mineralization alteration is studied further. Firstly, this paper mainly adopts BJKFIII mineral analyzer to obtain the contents of 124 rock and mineral samples which include quartz, kaolinite, montmorillonite, sericite, zoisite,saussurite, epidote, biotite. Secondly, by analyzing the relationship of the contents of 8 kinds of above alteration minerals and the ASTER remote sensing image spectral contributions, the mechanism of typical porphyry alteration mineral spectral response was revealed. Finally, this paper also established the relation model between the absorption depth (H) in ASTER data in 2.1 - 2.3μm and the alteration mineral content (X) , and the relation model of the absorption width (W) in ASTER data in 2.1 - 2.3μm and the alteration mineral content (X) in Pulang porphyry copper mining area (table 1).The results show that the absorption depth in ASTER in 2.1 - 2.3μm mainly obtain positive contributions from the kaolinite ,and chlorite, but obtain strongly negative contribution from sericite and montmorillonite. Meanwhile, the absorption width in ASTER in 2.1 to 2.3μm mainly obtain positive contributions from kaolinite , saussurite, and epidote, but obtain strongly negative contribution from montmorillonite ,sericite, chlorite, biotite.

By the field verification, the experimental results are in conformity with actual exploration. The models could be used in the exploration of the porphyry alteration zones especially in hard region with ASTER data.

Table 1 The Relationship Between the Depth(H) and Width(W) in ASTER in 2.1 - 2.3μm to the Content of the Alteration Minerals

X_{Quartz}
$X_{Kaolinite}$

$X_{Montmorillonite}$
$X_{Sericite}$
$X_{Saussurite}$
$X_{Chlorite}$
$X_{Epidote}$
$X_{Biotite}$

H

H (Absorption Depth)
-0.50527
2.00982
-5.63724
-0.72234
0.778631
2.662073
2.360873
0.132645

W

W (Absorption Width)
-0.61619
45.05145
-35.6599
-13.2719
11.34547
-43.3495
59.88952
-12.3489

References:

[1]Rowan, L.C., Goetz, A.F.H. and Ashely, R.P., 1977, Discrimination of hydrothermally altered and unaltered rocks in visible and near infrared multispectral images [J]. Geophysics, (42):522-535.

[2]Amin Beiranvand Pour, Mazlan Hashim, 2012,The application of ASTER remote sensing data to porphyry copper and epithermal gold deposits[J], Ore Geology Reviews, (44):1-9