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A Study of Wajiertag Magmatic Deposit Based on Magnetic Anomalies

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1 Introduction

The mineralization associated with the continental flood basalt has long been enjoying close attention，Which is considered to be most promising magmatic deposit type in China. The Panzhihua magmatic V-Ti-Fe deposit is one of the typical examples(Zhang, 2014; Tang, 2004). Because the Permian massive mafic eruptive events happened in the margin of Tarim ancient land, the flood basalts and mafic and ultramafic rocks were distributed. Wajiertag magmatic V-Ti-Fe deposit is located 45 km outside the Bachu to the southeast. Despite of the similarity with Panzhihua deposit in terms of ore-forming geological condition, the features of magnetic anomalies are considerably different. Combined with geophysical and geological studies, the results indicate that Wajiertag iron deposit is formed through the later-stage Fe-rich mafic magma intrusion and evolution after intrusion of gabbro. In this paper, we aim to provide useful information for magmatic V-Ti-Fe deposit.

2 Geological Setting

The Wajiertag intrusion, located at the western margin of the Tarim Block, is a part of the Permian Tarim large igneous province. It is ～5000 m in length, 1500-3000 m in wide, and striks to the northeast mainly consisting of the complex including gabbro, pyroxenite and olivine-pyroxenite. Two iron ore belts were found in pyroxenite and olivine-pyroxenite intrusion. The area are largely covered by Quaternary. The hornblende syenite intrusion and Sinian strata are sporadically exposed over the area (Lan, 2013).

3 Geophysical Setting

3.1 Characteristics of magnetic anomalies

On the 1:5,000,000 contour map of the aeromagnetic ΔT (Xiong et al., 2013), the negative anomaly has

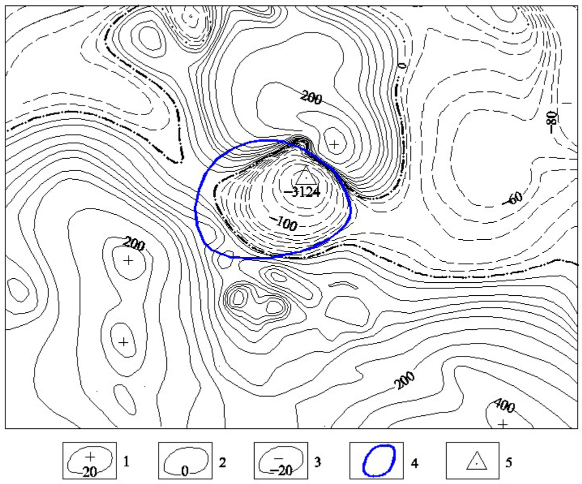

Fig.1 Aeromagnetic anomalies in Wajiertag area
1-Positive contour and its annotation (nT), 2-zero contour and its annotation (nT), 3-negative contour and its annotation (nT), 4-distribution of Wajiertag complex body, 5-Wajiertag iron deposit

significant intensity -with a value up to 3214 nT -a steep gradient in the Wajiertag area. The area of this anomaly is ~100 km^2, defining an approximate circle surrounded by the positive anomaly. The negative anomaly corresponds to the Wajiertag complex body. Wajiertag magmatic V-Ti-Fe deposit is located in center of the negative magnetic anomaly (Fig.1). On the 1:1,000 contour map of the high-precision magnetic ΔT, this strong negative anomaly can be divided into a string of anomalies. The six negative anomalies match well with the pyroxenite and olivine-pyroxenite intrusions respectively and the rest are located in a Quaternary-covered area. The negative anomalies above the proven iron ore bodies may be distinguished by their high amplitude reaching 10000-20000 nT (Lan, 2013). Some positive anomalies correspond to the gabbro and diorite.

3.2 Physical properties of rock and ores

The results from Table 1 show that the susceptibility and remnant magnetization are strong for the magnetite ore, olivine pyroxenite and pyroxenite, and that the

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Table 1 Magnetism of rocks and iron ores in the Wajiertag area.

Name	Susceptibility κ(10^{-6} CGSM)	remanence Jr(10^{-6} CGSM)	Remnant Inclination (°)
	Usual Value	Usual Value	
high-grade magnetite ore	100918	55518	-49
magnetite ore	36375	13156	-45
olivine pyroxenite	19049	6715	-46
magnet-dominant ore	18919	4073	-54
pyroxenite	7146	1308	-53
Pyroxenite(hole)	8248	407	
diorite	1321	145	
kimberlite	3594	115	
Other rocks	none or weakly magnetic		

(modified from Gao,2007).

inclination between remanence and geomagnetic is > 100°, which are the main geological bodies that could cause the strong negative anomalies in this area. The susceptibility and remnant magnetization for diorite and kimberlite are moderate, which are the main geological bodies that could lead to the positive moderate anomalies in this area. Other rocks are none or weakly magnetic without capacity to cause anomalies.

4 Discussion

As mentioned above, Wajiertag and Panzhihua deposits are similar in metallogenic background while different in magnetic characteristics. Distinct from the strong positive aeromagnetic anomaly in Panzhihua area, a significantly negative aeromagnetic anomaly is displayed in Wajiertag. How is the Wajiertag negative anomaly produced? It can be seen that remnant magnetization is much larger than induced magnetization for magnetite ore, olivine pyroxenite and pyroxenite (table 1). The inclination between remanence and geomagnetic is ~ 110°, which shows that during magnetic material cooling to the Curie temperature, the local magnetic field had much greater impact on it than the geomagnetic field did. In other word, there was a strong magnetic body that produce spontaneous magnetization，resulting in reversal magnetization of the magnetic material which come from deep mantle plume. According to the geological and geophysical research, there are syenite, gabbro and flood basalt around pyroxenite and olivine-pyroxenite, but the magnetic fields generated by syenite and flood basalt are not strong enough to cause reversal magnetization of magnetic materials. The susceptibility is strong for gabbro. The distributions of gabbro rock correspond to positive anomalies respectively（Lan，2013）. So we believe that the strong magnetic field is from the early-stage gabbro intrusion and that mineralization associated with later-stage intrusion and evolution.

5 Concluding Remarks

Our study leads to the following two major conclusions. (1) gabbro and olivine-pyroxenite including pyroxenite came from different material sources. Pyroxenite and olivine-pyroxenite may be from the later-stage magmatic intrusion. (2) The major iron ore bodies were formed during the later-stage magmatic cooling process. The negative anomalies are potential targets for iron ore exploration associated with mafic and ultramafic rocks in Xinjiang (xiong，2014）.

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