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## Application of Geophysical and Remote Sensing Methods to Predict for Potash Resource

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### 1 Introduction

Potassium is listed as one of the shortage of mineral resources in china. Geophysical and remote sensing technology plays an important role in prospecting for potash ressources.

### 2 Geophysical Methods

#### 2.1 Airborne geophysical method

Airborne gamma ray spectrometry was the direct method to prospecting potassium ore and found a number of potash deposits in the western region of Xinjiang, Qinghai and Inner Mongolia. Luobubo potassium base is one of the most successful examples, the potash anomaly has the following geophysical characteristics: (1) regional potassium background level is higher, potassium anomaly, residual potassium anomaly is obvious; (2) potassium anomaly and low background field set off each other and rely on each other; (3) uranium content is low and high ratio of K/Th; (4) content of KCl is high and residual gravity abnormally is low (Xu, 1994).

Other aerogeophysical (aeromagnetic, airborne gravity, airborne electromagnetic) methods are mainly used to determine tectonic position of potassium basin, basin boundary and control K fracture, which are indirect means to find potash.

#### 2.2 Ground geophysical methods

There are ground gamma spectrometry survey, well logging, seismic, gravity and other ground geophysical methods to prospect potash resources. The ground gamma spectrometry survey is a commonly method. The gamma-ray spectrometric characteristics of salt lake-type potash deposits follow as (1) lake sedimentary area: uranium, thorium, potassium is low background value; (2) the

surrounding diluvium: uranium, thorium, potassium content are higher background level than the lake; (3) the two elements of thorium and potassium are obviously positive correlation, it appears obvious anomaly on the lake with background of low potassium thorium (Kang et al., 2005).

With development of theory of oil, gas and salt are explored simultaneity, well logging and seismic data play an important role in prospecting potash ore. The identification of potash minerals, calculation of K<sub>2</sub>O as the content of potassium salt, distinguish potassium salt and mud and shale (Chen et al., 2012; Li et al., 2013). Application of seismic data to find potash salt resources and its characteristics were summarized by Qian and Zhou (1987). Pang (1987) carried out on prediction of potash in Qaidam Basin by using the gravity data, that brine potash deposit is t negative gravity anomaly, and potassium bearing brine layer thickness is negative gravity anomaly intensity was linear positive correlation.

### 3 Remote Sensing Method

Remote sensing is a universal and efficient method to prospecting potash deposits. During the 80s last century, remote sensing technology was used to prospecting potash deposits in western China of Xinjiang and Qinghai regional geological investigation and received successful result. A number of potash deposits was discovered such as Luobubo potash base, the evaluation method and prospecting modle of quaternary Salt Lake-type potash deposits were summarized and a set of remote sensing signs were established. The potassium anomalies of luobubo potash bases appear as dark red mushroom image in Landsat conventional false color composite image (Li, 1991); spindle shaped spot mottled image area, mushroom brown black image area and ear shaped light gray with white lines in the ETM471 were three image areas in the

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ETM471 (Zhang, 2010). Furthermore, multi remote sensing method were used to prospecting potash in Inner Mongolia, Xinjiang, Tibet, Qinghai and other regions (Liu and Zhang, 2000; Liu et al., 2004; Zhang et al., 2008, Zhang and Yao, 2011).

### 3 Geophysical and Remote Sensing Combined Method

In the early 80's, geophysical and remote sensing combined methods were used to prospecting potash deposits in Xinjiang, Qinghai and other regions. Luobubo potash base is one of the successful examples. The potassium anomaly area in Luobubo were low radiation field, low resistance and good conductive electromagnetic field and considerations well with dark area in remote sensing image. TM data were process and the extraction of "qualitative-quantitative" potash ore information were researched (Wang et al., 1997), and found that remote sensing mineralization information is correlation with the fix quantify data measured by ground gamma ray spectrum and the analytical data for ground potash ore.

In a word, it is a complicated systematic project to prospecting for potash deposits. We should pay more attention to geophysical and remote sensing technology to prospecting for potash deposits, especially the geophysical and remote sensing combined method. At the same time, we can prospect potash ore during the exploration of oil and gas.

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