Geochemical Characteristics and Resource Assessment of the Typical Metal Mine Tailings in China

PAN HANJIANG[1]

[1] Institute of Geophysical & Geochemical Exploration, Langfang, Hebei 065000, China. panhanjiang@igge.cn

Nowadays, tailings have become the leading contributor to China's industrial solid wastes in the volume of both production and accumulation. It is particularly important that within these tailings, there are abundant metal sulphides which are economically recoverable and on the other hand, harmful to surrounding environment. In this contribution, mineral compositions, element concentrations and distribution of tailings pond of 7 typical metal mines in China were investigated and mineral resource potential of the tailings were assessed through the studies of element geochemistry coupled with petrology and mineralogy.

The distribution patterns of elements and minerals in the tailings and their controlling factors include: (1) Tailings derived from different ore types. It appears significant vertical variations in element concentrations and mineralogical compositions in the tailings pond; (2) gravitational separation during discharge of tailings. The structure and construction methods (location of the tailing dam) of tailings pond largely determine the location of discharge and corresponding element distribution and (3) difference in beneficiation processes during different periods. Resulting in the element concentrations and distribution are heterogeneous in tailings, which can be reflected in the following three aspects: (1) tailings from different mine areas; (2) different tailings ponds from the same mine and (3) in the tailings ponds. Consequently, during the process of tailings ponds exploration, Work should to be carried out in different phases, with different survey methods used in each phase.

The advantages and disadvantages of methods of resource assessment in tailings were compared through the construction of three-dimensional model of the tailings and simulation experiment of reducing drill number. The results show that for valley-type tailings ponds, it is better to collect drill samples in the center perpendicular to the direction of the dams. However, for hillside- and flat-type tailings ponds, cruciform and multi-directional profile sampling methods are recommended. The potential quantities of resources for 9 tailings ponds have been estimated, and there is great potential value in metallic elements in the tailings ponds from polymetallic mineral deposits.

Keywords: tailings, geochemistry, 3D model， resource assessment of tailings