Risk assessment of sulfide ores of spontaneous combustion based on thermal analysis and AHP method

Abstract: The sulfide ores is easily oxidized in air during the mining and processing. A large quantity of heat by the oxidation reaction resulted from spontaneous combustion of sulfide ores. It would not only threaten the life of employees, but also causes economic losses and environmental issues. Therefore, the spontaneous combustion of sulfide ores is one of the major safety problems in mining at present. There are many factors affecting the spontaneous combustion of sulfide ores. However how to reasonably determine the influence degree of factors on the spontaneous combustion of sulfide ores and effectively control the risk of the spontaneous combustion is a problem which has not been solved. In this paper，based on thermal analysis and AHP method，the risk of spontaneous combustion of sulfide ores is evaluated. The TG-DSC curves are obtained by using the thermal analyzer. The activation energies are calculated by the iso-conversional method(FWO).The particle size, air flow and quality are taken as the assessment index factors. The risk probability of the basic index is determined and the judgment matrix is established based on the activation energy. The risk assessment index system of spontaneous combustion of sulfide ores is established by using AHP method. The risk weight of each factor is obtained. The research shows that the risk weight of the factors following big to small is particle size, air flow and quality. The accuracy and reliability of the risk evaluation results are improved by way of quantitative and qualitative analysis. It provides reference for sulfide ore enterprises to assess the risk, so as to reach the goal to prevent and control the risk of the spontaneous combustion.

Key words: risk assessment; sulfide ores; thermal analysis; AHP method;