On-line Determination of Rare Earth Distribution by Energy Dispersive X-ray Fluorescence Spectrometry

Li Hongwei[1], Qu Huayang[1,*], Hu Shaocheng[1], Lu Mingbo[1], Zhou Chao[1]， Shen Xuejing[1,2]

[1]NCS Testing Technology Co., Ltd., Beijing, China; [2]China Iron and Steel Research Institute Group, Beijing, China

Rare earth elements (REEs) have been widely used in metallurgical machinery, electronic information, petrochemical, energy and other fields due to their unique physical and chemical properties. The REEs with enhanced optical, electrical and magnetic properties can be used to prepare advanced materials, such as fluorescent, polishing, catalytic and permanent magnetic materials. The indispensible REEs in the advanced materials, despite with trace amount, are known as "industrial vitamins". The preparation of unitary REE with high purity is fundamental to the industry of new rare earth material. The unitary REE is separated by hydrometallurgical process from rare earth concentrate with more than ten kinds of rare earth elements. The continuous separation process is evaluated by REE distributions. At present, most of the REE distributions in factories are obtained via artificial sampling coupled with ICP OES. The detection lags behind the production, resulting in unstable qualities of products.

In order to determine the distributions of REEs on line, a XOR-50 rare earth distribution on-line analytical equipment was developed based on ED-XRF. A on-line determination of REE in rare earth separation process was established. The excitation voltage, current and filter were optimized according to the characteristics of REEs. The influence of the salinity was corrected by mathematical technique. The absorption enhancement effect was calculated by fundamental parameter method. The results of on-line detection are consistent with ICP OES. The relative standard deviation (n=11) of the main REEs (w> 1%) is less than 0.6%. The equipment can carry out automatically from the extraction solution in 1 minute. The measurement intervals can be set by the operator.

Combining on-line introduction of the rare earth material, simultaneous analysis of multi elements, rapid detection in 1 minute, on-line analysis with self-starting and real-time transmission of the results, the method meets the requirement of dynamic control of rare earth separation process. At present, the instrument and method are applied in many factories, which is of great significance for the control in the rare earth separation process.

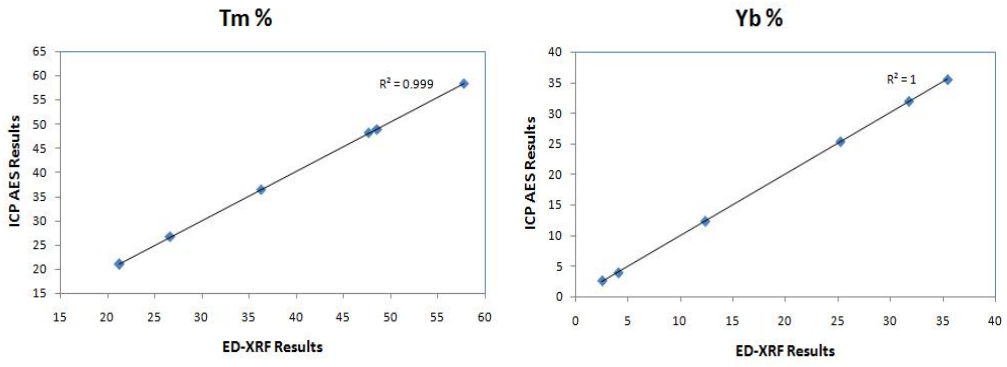

Figure 1 The Tm, Yb in the extraction solution of heavy REEs detected by on-site determination and lab examination