

Abstract

## **Recovery of Rare Earths from Waste Fluorescent Lamps**

Europium and yttrium are critical materials required for LED, fluorescent lamp, and flat panel display production. More than 8000 tons of material from end-of-life lamps are sent to the landfill each year in the form of phosphor dust. Based on the average composition of phosphor dust, a resource of 50 tons a year of europium oxide and 800 tons a year of yttrium oxide are available in the United States. Recycling europium and yttrium from waste lamp phosphors is an innovative method to supply them to high technology applications. Phosphor powder from recycled lamps is retorted, sieved, and selectively leached to produce a salable, mixed, semi-pure europium and yttrium oxide product. After conducting an economic analysis, the NPV for the process was \$19.4 million dollars. The break-even price for yttrium oxide is \$15.4 per kg yttrium oxide and \$420 per kg europium oxide based on China FOB rare earth prices.