Leaching of Korean monazite for the recovery of rare earth metals

Rekha Panda, Archna Kumari, Jhumki Hail, Susanta Kumar Sabharwal, Manish Kumar Jha, Vinay Kumar, J. Rajesh Kumar, Jin Young Lee

Abstract

RE are usually dispersed, but rarely concentrated and found only in a group, not individually.

Introduction

The technological innovations resulted in various applications using rare earth metals (REM), which lead to a steep increase in their demand. Monazite is the second most essential naturally occurring phosphate mineral containing REM. The present work compares the recovery of REM from Korean monazite which contained mainly 50.12% rare earth oxides and 26.4% phosphate. For the recovery of REM from monazite, the hydrometallurgical process consisting of alkaline leaching of phosphate followed by acid dissolution of REM has been reported. As the presence of phosphate decreases the leaching efficiency of REM from monazite, the studies were carried out initially for the dissolution of phosphorus present in the monazite in an autoclave using sodium hydroxide, which resulted in the formation of REM-oxide and soluble sodium phosphate. To get the optimum condition for phosphate dephosphorization by alkaline leaching, the various process parameters such as concentration of sodium hydroxide, temperature, leaching time and pulp density were studied. The obtained data was washed with hot water and filtered to get sodium phosphate in the solution. A minimum of 95% phosphorus was removed from monazite concentrate using 50% sodium hydroxide solutions (w/v) at 175°C in 4 h mixing time maintaining the pulp density of 100 g/L from the phosphate free monazite sample. REM was leached out using hydrochloric acid. More than 95% of REM was found to be leached out using 6M HCl at constant pulp density 110 g/L. Comparison of 90% and mixing time 2 h further studies are in progress to obtain optimum solution and salt of REM from chloride leach liquor using precipitation/solvent extraction/ion-exchange techniques.

Keywords: Monazite, Hot alkaline digestion, Dephosphorization, HCI leaching, Rare earth metals (REMs).

Materials and Methods

Effect of Pulp Density

Chemical Composition

Characterization of Korean monazite

Results and Discussion

Conclusion

References