

Separation of Sm-Eu-Gd mixed solutions using bifunctional ionic liquid [A336][P204]

N.A. Ismail^{1,2}, A. Hisyam² and S. Shariff¹

¹Earth Resources and Sustainability Center, Universiti Malaysia Pahang,
Lebuhraya Tun Razak, 26300, Kuantan Pahang, Malaysia.

²Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang,
Lebuhraya Tun Razak, 26300, Kuantan Pahang, Malaysia.

ahisyam@ump.edu.my

Abstract

This paper studied the use of bifunctional ionic liquid as an extractant to extract and separate Sm-Eu-Gd mixed solutions. The extractant combined the conventional extractant di-(2-ethyl hexyl) phosphate (P204) with ionic liquid Aliquat 336 (A336) through acid/base neutralization method. This work explored the effect of extraction medium (chloride, sulphate and nitrate), acid concentration (1.5-5.0M) and organic to aqueous phase ratio (1:1, 3:2, 7:3, 4:1, 9:1) to determine the separation factor of each metals. Based on the results, Sm (III) showed the highest separation factor of total solute (β Sm/total=2.81) in the nitrate medium with the acid concentration of 3.0M and organic to aqueous phase ratio of 4:1. Sm (III) was chosen to be separated in the first stage of extraction from the Sm-Eu-Gd mixed solution. In the second stage, the optimized condition to separate the remaining EuGd mixed solution into individual metal was also in the nitrate medium with organic to aqueous phase ratio of 3:2, except with lower acid concentration, 2.0M. This work shows that [A336][P204] is an impeccable extractant candidate for an improved and environmental friendly to separate Sm-Eu-Gd in both laboratory and industrial application.

Keywords: bifunctional ionic liquid; [A336][P204]; samarium; europium; gadolinium