



HAL
open science

Diphasic acid-basic properties of new organophosphorus extractants

Kateryna Omelchuk, Moncef Stambouli, Alexandre Chagnes

► **To cite this version:**

Kateryna Omelchuk, Moncef Stambouli, Alexandre Chagnes. Diphasic acid-basic properties of new organophosphorus extractants. The 21st International Solvent Extraction Conference - ISEC 2017, Nov 2017, Miyazaki, Japan. hal-01814007

HAL Id: hal-01814007

<https://hal.science/hal-01814007>

Submitted on 12 Jun 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Diphasic acid-basic properties of new organophosphorus extractants

Kateryna Omelchuk^{1,*}, Moncef Stambouli² and Alexandre Chagnes³

¹PSL Research University, Chimie ParisTech - CNRS, Institut de Recherche de Chimie Paris, 75005, Paris, France

²Central School of Paris, LGPM laboratory, 2 Avenue Sully Prudhomme, 92290 Châtenay-Malabry

³University of Lorraine, GeoRessources Lab, UMR CNRS 7359, 2 Rue Doyen Marcel Roubault, TSA 70605, 54518 Vandoeuvre Les Nancy, France

Acidic organophosphorus compounds have been extensively studied as extractants for numerous metals and have been shown to exhibit a good extraction and separation efficiency [1]. The overall distribution equilibrium of an organophosphorus extractant HL between organic and aqueous phases involves a great number of individual equilibria [2]. However, only three of them are usually taken into account in the literature: the dimerization of HL in organic phase, the partition equilibrium of HL between the two phases and its acid dissociation in aqueous phase [3]-[4]. The metal extraction by organophosphorus extractants requires to increase the pH of acid leaching solution by adding of alkaline reactive such as sodium hydroxide for instance. In some cases, saponification of extractants can occurs and may lead to change in extraction equilibria of metals.

In the present work, saponification of the following extractants diluted in kerosene has been investigated by performing biphasic titration:

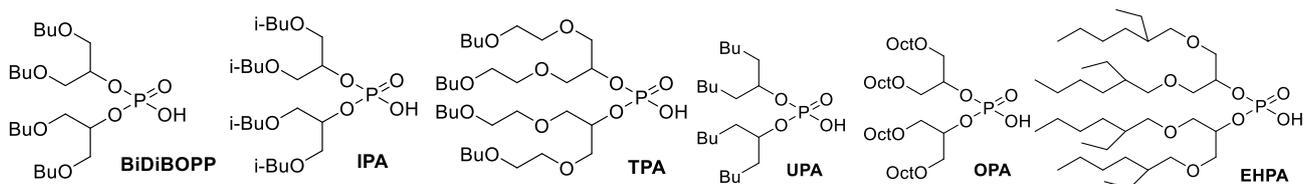


Figure 1. Structure of organic extractants synthesized in the laboratory.

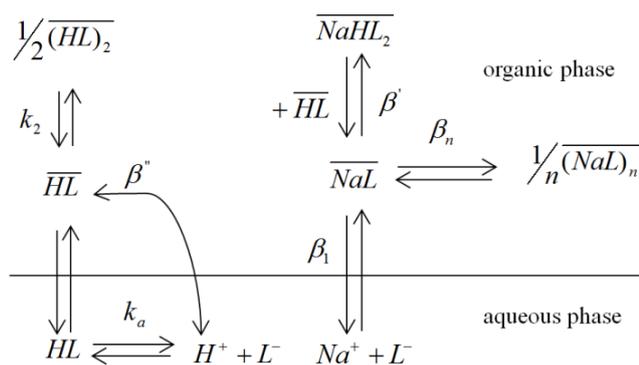


Figure 2. Equilibria included in the physicochemical model.

The titration curves have been modelled by means of a physicochemical model including the equilibria reported in Figure 2. The formation constant β_1 , β' , β'' and β_n , the dimerization constant (k_2) and the dissociation constant (k_a) of the acidic extractant have been used in the model. The values of β_1 , β' , β'' and β_n have been determined by fitting the experimental data of biphasic titration with the model while k_2 and k_a values have been determined by VPO measurement and monophasic titration, respectively. Finally, the physicochemical model is used to investigate the speciation of the extractants as a function of the pH.

[1] Z. Kolarik, *Solvent Extr. Ion Exch.*, vol. 28, no. 6, pp. 707–763, Oct. 2010.

[2] C. Sella and D. Bauer, *Solvent Extr. Ion Exch.*, vol. 6, no. 5, pp. 819–833, 1988.

[3] X. Fu, Z. Hu, Y. Liu, and J. A. Golding, *Solvent Extr. Ion Exch.*, vol. 8, no. 4–5, pp. 573–595, Jun. 1990.

[4] R. K. Biswas, M. A. Habib, and M. N. Islam, *Ind. Eng. Chem. Res.*, vol. 39, no. 1, pp. 155–160, Jan. 2000.