

Supplementary material

Synthesis of Novel γ -Carbon-Substituted Dialkylphosphinic Acids (P355/P227-355): Unraveling Structural Symmetry Effects on Middle Rare Earth Separation and Extraction Mechanism

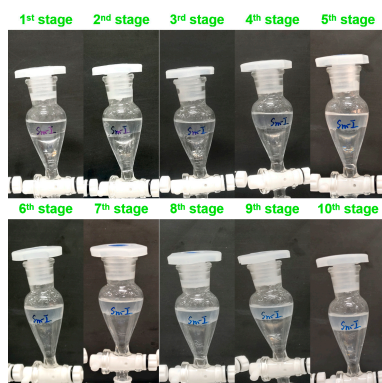
Ruiyi Sun ¹, Fan Li ¹, Yu Xie ¹, Na Sui ², Yong Li ^{3,*} and Junlian Wang ^{1,*}

¹ School of Resources and Safety Engineering, University of Science and Technology Beijing, Beijing 100083, China; baageau@163.com (R.S.); lf3035663752@126.com (F.L.); xieyu13698295875@163.com (Y.X.)

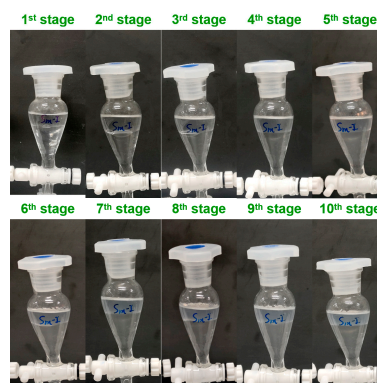
² School of Metallurgical and Ecological Engineering, University of Science and Technology Beijing, Beijing 100083, China; suina@ustb.edu.cn

³ Consulting and Research Center of Ministry of Natural Resources, Beijing 100035, China

* Correspondence: bobyzhang@126.com (Y.L.); wangjunlian306@163.com (J.W.)



(a) P355 - 10 vol% isooctanol



(b) P355 - 20 vol% isooctanol



(c) P227-355 - 10 vol% isooctanol

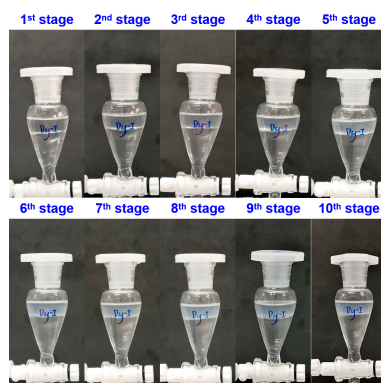


(d) P227-355 - 20 vol% isooctanol

Figure S1. Extraction phenomena of Sm in the presence of isooctanol as modifier: For (a)(b) P355 and (c)(d) P227-355.



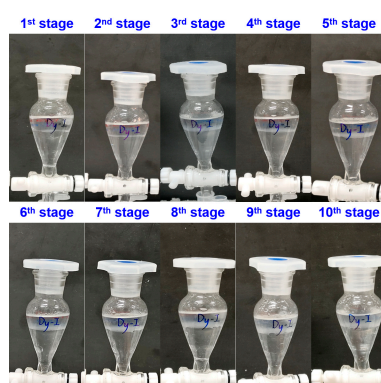
(a) P355 - 10 vol% isooctanol



(b) P355 - 20 vol% isooctanol

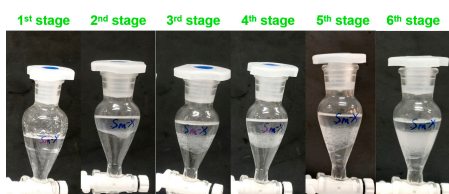


(c) P227-355 - 10 vol% isooctanol

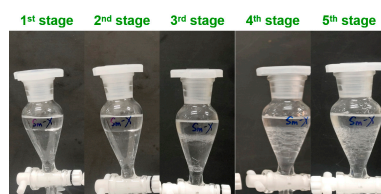


(d) P227-355 - 20 vol% isooctanol

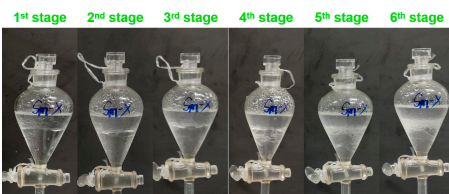
Figure S2. Extraction phenomena of Dy in the presence of isooctanol as modifier: For (a)(b) P355 and (c)(d) P227-355.



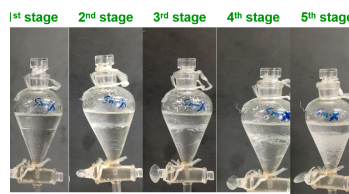
(a) P355 - 10 vol% xylene



(b) P355 - 20 vol% xylene

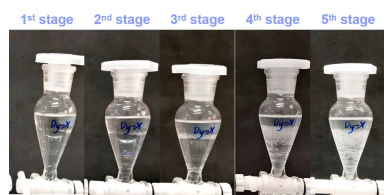


(c) P227-355 - 10 vol% xylene

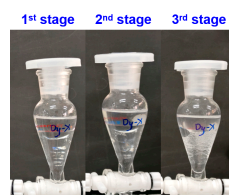


(d) P227-355 - 20 vol% xylene

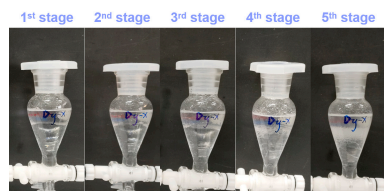
Figure S3. Extraction phenomena of Sm in the presence of xylene as modifier: For (a)(b) P355 and (c)(d) P227-355.



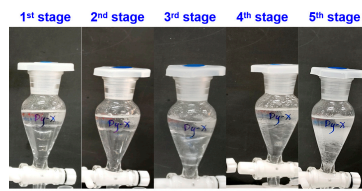
(a) P355 - 10 vol% xylene



(b) P355 - 20 vol% xylene



(c) P227-355 - 10 vol% xylene



(d) P227-355 - 20 vol% xylene

Figure S4. Extraction phenomena of Dy in the presence of xylene as modifier: For (a)(b) P355 and (c)(d) P227-355.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.