Ph.D. defense

Institut de Chimie Séparative de Marcoule / CEA Marcoule
(UMR 5257, CEA, CNRS, Université Montpellier, ENSCM)

SAYED ALI MOUSSAOUI

will present his Ph.D. dissertation

Liquid/liquid separation governed by kinetics

The defense will take place on **Wednesday, December 15th, 2021** at **10.00 am**
in the ICSM Auditorium

In order to respect the procedures for organizing public events in the ICSM auditorium, people who wish to attend the thesis can register before by sending an e-mail to damien.bourgeois@cea.fr. The health pass and the surgical mask are mandatory.

The optimization of the extraction processes requires a thorough analysis of the thermodynamic and kinetic features of the system. While there is considerable amount of literature on the equilibrium aspects of solvent extraction of metals, there is much less information available on the extraction kinetics. In this thesis we characterized the extraction kinetics of Pd(II), Nd(III) and Fe(III) with two malonamides of the same molecular formula but different topologies: *N,N,N',N'*- tetrahexylmalonamide (THMA) and *N,N,N',N'*- dimethyldibutyltetradecylmalonamide (DBMA). A thermodynamic characterization of the extraction systems was first carried out, and THMA proved to be very selective for the extraction of Pd(II) compared to DBMA. The characterization of the extraction kinetics was performed using the single drop technique, where the global transfer constants of Pd(II), Nd(III) and Fe(III) in the extraction with THMA and DBMA were determined. The study was further developed to determine the extraction rate laws of the systems. For this purpose, an experimental methodology based on the initial rate method, in small scale batch experiments was implemented for a fast and reliable screening of the extraction kinetics. Proceeding with this methodology, we could highlight the differences of the extraction kinetics of Pd(II) with THMA and DBM. The corresponding extraction mechanisms were proposed. Finally, screening of extraction kinetics in batch experiments demonstrated the benefit of excess dihexylamine (DHA) employed during THMA preparation through a gain in kinetics performance. Thus, a performing molecular system for the extraction of Pd(II) with THMA was established. Altogether, this work has highlighted the interest of mastering the kinetics of solvent extraction for the development of selective processes of separation.

Keywords: Liquid Extraction; Recycling; Downstream of the Fuel Cycle; Kinetics; Transition Metals; Ruthenium