TECHNISCHE UNIVERSITÄT DRESDEN

HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

Fakultät Maschinenwesen Institut für Verfahrenstechnik und Umwelttechnik
Professur für Transportprozesse an Grenzflächen
Technische Universität Dresden, 01069 Dresden

Optical measurements of refractive index of rare earth solutions (5 – 10 h/week for 3 Months, extend possible)

Rare earth elements are group of 17 elements in periodic table. They have unique physicochemical properties which make them essential in many high-tech components, e.g. electric mobility, laser, catalyst etc. The separation of rare earths in industry is mainly done by liquid-liquid extraction, a technique of high environmental footprint. The separation is based on the marginal difference in their affinity against the extractant used. Hence, the separation factor, a parameter quantifying the "separability" of these elements, are small. Normally, hundreds of repeating stages has to take place in plants producing multiple single rare earth products.

We are actively researching a potentially more environmentally friendly alternative approach to improve the separation factor by modulating their respective extraction kinetics. Addressing the magnetic susceptibility of rare-earth ions inside a stray field from magnetic source, the Kelvin force acting on the rare-earth can tune the extraction kinetics selectively. To experimentally quantifying the enhancement, detailed mapping of refractive index of rare-earth solution is mandatory which further facilitates an in-situ space- and time- resolved monitoring of the extraction process of rare-earth mixtures. In order to understand the chemical-physical fundamentals of the process, detailed investigations are necessary.
Interferometry enables non-invasive real-time measurement of substance concentrations. This is an attempt to determine the reaction law for rare earth elements such as samarium. For this purpose, the refractive index of the substance is measured, which is, among other things, temperature-dependent. Consequently, an investigation of factor marks a starting phase where promising candidates will be offered opportunity (***Belegarbeit/ Diplomarbeit***) for further laser based optical experimentation and algorithm developments.

Major working package:

1. Characterization of optical properties of rare earth elements as a basis for interferometry experiments
2. Evaluation and assessment of self-measured values for better process understanding

Requirement:

1. Interest on applied optical experiment
2. Work conscientiously and safely
3. Capable of communication and some basic data analysis skill

Contact:
Alexander Bidmon (a.bidmon@hzdr.de; alexander.bidmon@tu-dresden.de)
& Dr.-Ing. Zhe Lei