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Application of vegetable oils for extraction of rare-earth elements from water solutions

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Various types of vegetable oil-based organic solvents (VOS), i.e. vegetable oils (corn, canola, sunflower and soybean oils) with and without extractant (pure oleic acid), were investigated into their potentiality as greener substitutes for the conventional petroleum-based organic solvents to extract REM from aqueous solutions [1, 2]. The pH-extraction isotherms of Ce (III) using various vegetable oils loaded with oleic acid were investigated and the percentage extraction of Ce (III) achieved by different types of VOS was determined. Vegetable oils without extractants showed a poor extractability for Ce (III). Vegetable oils loaded with oleic acid were found to be the most effective VOS for Ce (III) extraction and, thus, are potential greener substitutes for the conventional petroleum-based organic solvents. It was shown that all vegetable oils investigated such as olive and sunflower, either with or without naphthenic acid exhibited a similar trend of extractability for Ce (III) from aqueous solutions. A sigmoid curve was obtained for all the pH-extraction isotherms of Ce (III) investigated with various types of vegetable oils loaded with 500 mM of naphthenic acid as VOS. The extraction was the lowest at pH of 4.0, but increased sharply from 4.7 to 5.5, and achieved its maximum from 5.5 to 6.0. Vegetable oils without extractants were poor VOS for Ce (III) wherein only about 10% of Ce (III) was extracted. Hence, vegetable oils functioned more as diluents than as additional extractants in Ce (III) extraction. Vegetable oils loaded with 500 mM naphthenic acid, however, were effective VOS where more than 90% of Ce (III) was extracted from aqueous solutions. Therefore, naphthenic acid functioned as an effective extractant in Ce (III) extraction by various types of VOS.

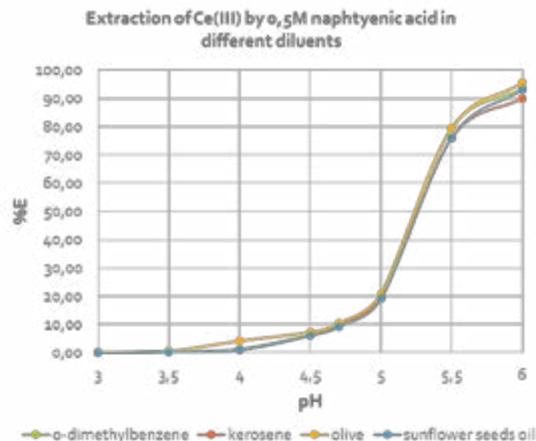


Figure. 1: Degree of extraction Ce (III) from the equilibrium pH of the aqueous phase in the extraction solution of oleic acid in o-xylene, paraffin, olive oil and sunflower.

Biography

Denis Lutskii graduated St. Petersburg State Mining Institute (Technical University) on a specialty "Metallurgy of ferrous metals", qualification "engineer". In 2011, after graduate school, defended his thesis for the degree of candidate of technical sciences, specialty 05.16.02 "Metallurgy of ferrous, non-ferrous and rare metals", thesis - "Recovery and separation of lanthanides hydrometallurgical methods for complex processing of raw low-concentration"

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