

## BICINE AS ALKYLAMINEDICARBOXYLIC ACID ANALOGUES FOR REE ION CAPTURE CHELATORS

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### Structured Abstract

Rare-earth elements (REEs) play a crucial role in modern technology, but their separation remain challenging due to 'Lanthanide Contraction'. Conventional separation methods are environmentally hazardous. This research proposes the potential of bicine, as a more environmentally friendly alternative for REE processing compared to EDTA, NTA and DTPA. Complexations of bicine with lanthanum, cerium and erbium was done and characterised using FTIR spectroscopy and CHNS analysis.

### Background:

Rare Earth is used in numerous high-tech applications. REEs are usually found as a deposit of many lanthanides. Due to 'Lanthanide Contractions', the size differences among the Lanthanides are very small. The atoms have identical physicochemical properties. The current imperfect process of separating the REEs takes a huge toll on the environment. Bicine has several advantages over traditional ligands. It may be a greener alternative for REE processing.

### Methods:

0.03 mol of bicine and 0.03 mol of potassium hydroxide were dissolved in 40mL of water. 0.1 mol of REE was dissolved in 30mL of water. The solutions were then mixed and let in the 60°C oil bath for 4 hours. 1M standard solution of potassium hydroxide was added into the solutions to maintain the pH 8.5. The product was then let air dried for 3 weeks for crystallisation. The product were heated in DMSO and Ethanol to remove the unreacted reactants. The crystals were then washed with 2mL of water and characterised using FTIR spectroscopy and CHNS analysis.

### Results:

REE-bicine complexes were formed and characterised using FTIR spectroscopy and CHNS analysis. FTIR spectra wavenumber shifts in carboxylate region observed. Formation of new peaks at the carboxylate group indicates that it was functioning as monodentate and bidentate ligand. The IR peaks of  $[La(bicine)_2]Cl \cdot 3H_2O$  was accurately matched with the article while others followed a trend. The ligand: metal ratio was confirmed to be 2:1 using CHNS analysis. However, there were contaminations occurred as some sample had large differences between theoretical and actual elemental values.

### Conclusion:

The findings of this study indicated the potential of bicine to be used as a greener alternative in REE processing. It may put Malaysia to an advantage by initiating a better REE processing method.

**Keywords:** Rare Earth Elements, Bicine, Crystallisation, Complexation

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