

DEVELOPMENT OF IONIC SALT FOR CALCITE AND BARITE SOLID SCALE DISSOLUTION

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Extended Abstract

Amino acid based ionic salt contains both an amino and a carboxylic acid residue in a single molecule, with various side groups and a chiral carbon atom, make it a candidate as a platform for functional salt [1]. The carboxylic group often found in several solid scale solvents such as ethylenediaminetetraacetic acid (EDTA) [2], diethylenetriaminepentaacetic acid (DTPA) [3], and glutamic acid diabetetic acid (GLDA) [4] known to plays important role in solid scale dissolution. The main objective of this study is to synthesize amino acid-based ionic salt from glutamic acid and monosodium glutamate. This study includes the evaluation of the amino acid ionic salt for the dissolution of a barite and calcite solid scale. The salt was synthesized through alkylation of glutamic acid or its salt followed by metathesis to include desired cation and anion in the final product as shown in Figure 1 below. The product was analyzed using Fourier transform infrared (FTIR), CHNS analysis and nuclear magnetic resonance (NMR) to determine its molecular structure. Thermal gravimetric analysis (TGA) and differential scanning calorimetric (DSC) will be used to establish thermal properties of the ionic salts. Dissolution test using gravimetric analysis will determine the dissolution of calcite (CaCO₃) and barite (BaSO₄) in the salt solution. Inductive coupled plasma optical emission spectrometry is used in determining the concentration of metals ions after the dissolution. Figure 2 shows the FTIR analysis of two ionic salts produces from glutamic acid monosodium salt. Ionic Salt 1 was synthesized through alkylation and metathesis while Ionic Acid Salt 2 was produced through direct metathesis with fluorophosphate salt. Both salts retain primary amine and carbonyl throughout the reaction, however, Ionic Salt 1 does not contain carboxyl O-H group likely due to reaction with NaOH during the alkylation process. Solid scale dissolution involves the deprotonation of the carboxylic group (COOH) to form carboxylate ions (COO⁻) to attack metals ion in the solid scale[4-6]. It can be conclude that FTIR result indicates both ionic salt contains main functional group required in solid scale dissolution. The carboxylic group available in the salt as well as cation and anion is expected to plays an important role in dissolution of solid scale. It was recommended for the dissolution to be conducted with varies temperature and pressure.

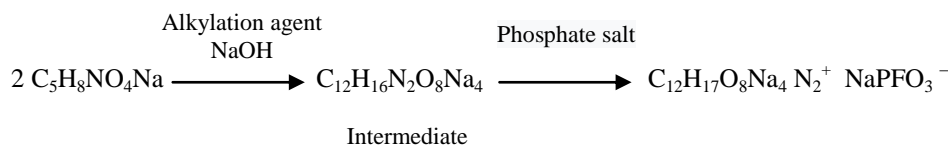


Fig. 1: Chemical reaction for production of glutamic acid based ionic salt.

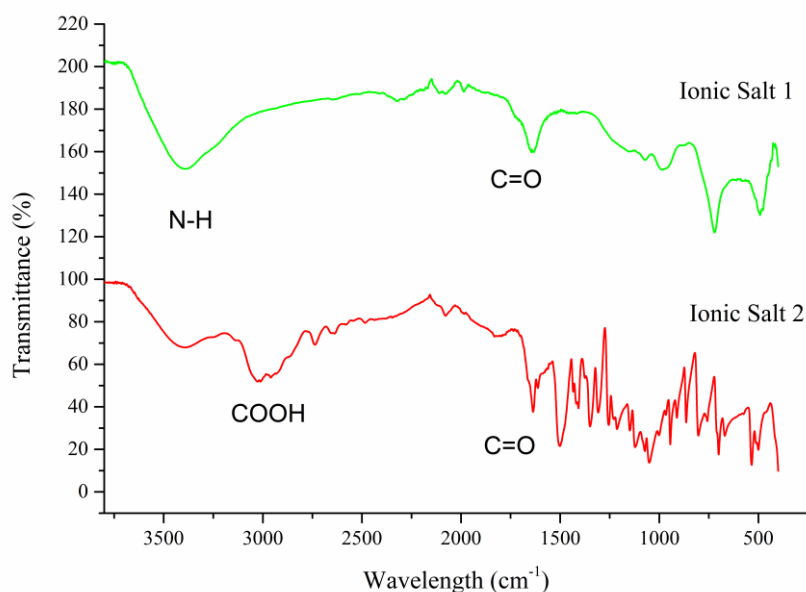


Fig. 2: FTIR analysis of two ionic salts produces from two different reactions. Ionic Salt 1 was produced from alkylation and metathesis of glutamic acid while Ionic Salt 2 was produced from metathesis with fluorophosphate salt.

Keywords: ionic salt; amino acid; calcite; barite; solid scale dissolution

Acknowledgment

This study was supported by UMP Internal Grant RDU 170322.

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