CHARACTERICTICS STUDY OF CO_2 INTO AQUEOUS POTASSIUM AMINO ACID SALT SOLUTION BY NMR SPECTROSCOPY

Jin ah Lim[1 2], Dong hyun Kim[2], Yeo il Yoon[1], Soon Kwan Jeong[1], Sung chan Nam [1*]

[1]Korea Institute of Energy Research, Daejeon 305-343, Korea

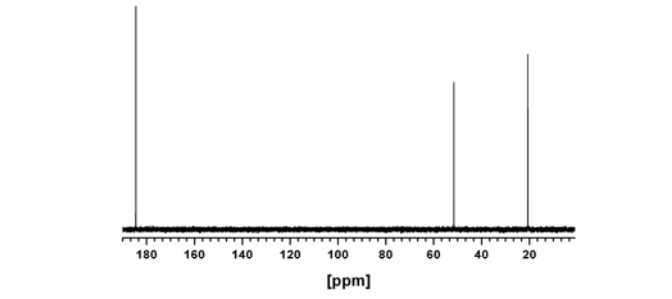
[2]Kyungpook national University, Daegu 702-701, Korea

** (scnam@kier.re.kr)*

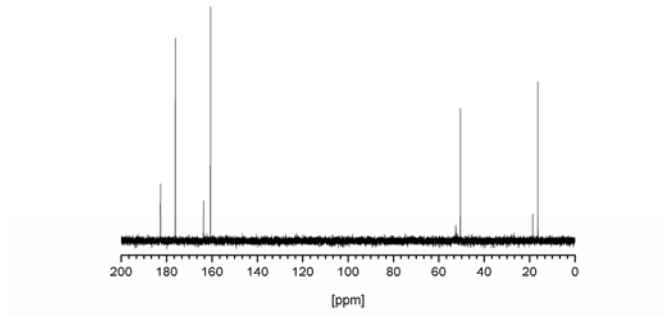
Keywords: Amino acid salt, Amine, CO_2 absorption, VLE (Vapor-Liquid Equilibrium), NMR spectroscopy

Rapid industrization and industrial activities since the industrial revolution have resulted in a sharp increase of greenhouse gas concentration in the atmosphere and are causing global warming. CO_2 generated by combustion of fossil fuels consists of around 80% of total greenhouse gas emissions and is considered the most important of the 6 major greenhouse gases. To reduce greenhouse gases and cope with the climate change problem at its root, the development of CO_2 capture technology is critical [1]. The wet absorption process, which is a post-combustion CO_2 capture technology using liquid absorbent, has been studied extensively in many countries for its ability to process high concentrations of CO_2 using retrofits of the existing process. The most important factor in the CO_2 absorption process is the selection of absorbent as this will determine the performance of the process. Generally, alkanolamine absorbents are effectively used to remove acid gas. In this study, the aqueous amino acid salt solutions were investigated as one of the carbon dioxide absorbent. The advantages of amino acid salts are their high resistance to degradation, low vapor pressure, and small amounts of oxidative degradation products [2]. The proton in carboxyl group of amino acid is substituted with metal ion by neutralization. The CO_2 loadings of potassium salt of amino acid were higher than those of sodium and lithium salt of amino acid [3]. The absorption capacity of the aqueous potassium salts of the L-alanine was measured and compared with MEA (monoethanolamine) and DEA (diethanolamine). The equilibrium partial pressure of CO_2 (P_{CO2}^*) and absorption rate were measured by using VLE (Vapor-Liquid Equilibrium) equipment. The experiment conditions were temperature at 298, 313 and 353K and concentration of 1 $mol \cdot L^{-1}$. The result of CO_2 loading high absorption capacity and absorption rate were faster than that of amine absorbent. Though good absorbent was considered by

many variables, absorption rate and capacity was more important factor. The CO_2 loaded solutions of MEA, DEA and aqueous potassium salts of the L-alanine solution were prepared by VLE apparatus at 333K. ^{1}H NMR and ^{13}C NMR spectra were obtained for these systems at 293 K. This study shows that it is possible to use this method to confirm the reaction mechanism of aqueous potassium salts of the L-alanine solution with CO_2.



(a)



(b)

Figure 1. ^{13}C spectra of potassium salt of L-alanine compared carbon dioxide before (a) and after (b) the reaction

References

[1] Korea Institute of S&T Evaluation and planning (KISTEP) 2010

[2] Hartono, A., Aronu, U.E., and Svendsen, H.F. Energy procedia 00 (2010) 000-000

[3] H.j. Song., S.m. Lee., J.h. Lee., J.W. Park., K.R. Jang., J.G. Shim., J.H. Kim., J. of KSEE, 31 (2009) 505