

D/L ratio of amino acid in terrestrial core sample and microbial activities

Yoshinori Takano[1], Kensei Kobayashi[2]

[1] Faculty of Engineering, Yokohama National Univ., [2] Dept. Chem. Biotech., Yokohama Natl. Univ.

Core sample such as terrestrial soil contains amino acid comes from microorganism activity.

Hydrothermal lode sample (SN 101) and Quartz lode sample (61) were collected at Toyoha mine, Hokkaido, Japan. HF degradation (5M HF-0.1M HCl, 110C, 16hr), acid-hydrolysis with 6M HCl for 2hr and desalted with cation exchange resin, after fractionation, derivatized sample were analysed by RP-HPLC.

D/L ratio of Asp was 0.127(38nmol/g-rock) , Glu 0.056 (58nmol/g-rock), Ala 0.047 (46nmol/g-rock) in hydrothermal lode sample. Small value of D/L ratio implies that there are microbial activities in these samples. Further work for the study of relationship between racemization and D/L ratio with biogenesis has been verified.

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Introduction

Core sample such as terrestrial soil contains amino acid comes from microorganism activity. Protein associated with life are only L-form of amino acid, D/L ratio will be risen by geochemical racemization progress. Actually, poor biological activity region shows higher D/L ratio. It has been known, recently, that some very specific environment such as submarine hydrothermal vent make biological active colonies. Here, D/L ratio of amino acid enantiomers was used as a biomarker in order to verify microorganism activity in core sample.

Experimental

Hydrothermal lode sample (SN 101) and Quartz lode sample (61) were collected at Toyoha mine, Hokkaido, Japan. The former contains rich pyrite and latter quartz. HF degradation (5M HF-0.1M HCl, 110C, 16hr) was carried for 0.50g grinding sample to eliminate silicate minerals. Then, samples were acid-hydrolysed with 6M HCl for 2hr and desalted with cation exchange resin. After fractionation, o-phthalaldehyde(OPA) and N-acetyl-L-cystein derivatization and solid phase extraction was carried before HPLC analysis. Derivatized sample were analysed by RP-HPLC (Pump: TOSOH CCPM II, column: YMC-Pack pro C18, 4.6mm i.d.*250mm), where gradient elution with 40mM acetic acid buffer (pH6.5) and 100% MeOH was applied. Representative proteinous amino acid such as aspartic acid, glutamic acid and alanine were quantificated for D/L ratio determination. Additionally, university campus soil also analysed as well as core samples.

Summary

Experimental procedure and gradient pattern of RP-HPLC made it possible that D- and L- enantiomers were well-separated each other. D/L ratio of Asp was 0.127(38nmol/g-rock) , Glu 0.056 (58nmol/g-rock), Ala 0.047 (46nmol/g-rock) in hydrothermal lode sample. The other amino acids detected were glycine, Valine and so on. Every proteinous amino acid of L-form was more predominant than D-form. In addition, non-proteinous amino acid such as alpha-aminobutylic acid and isovaline were detected as trace amount. The other sample, quartz lode showed nearly half amount of amino acid versus hydrothermal lode. Small value of D/L ratio implies that there are microbial activities in these samples. Further work for the study of relationship between racemization and D/L ratio with biogenesis has been verified.

This study was performed through Special Cordination Funds of the Ministry of Education, Culture, Sports, Science and Technology of the Japanese Government.