

**Absolute Asymmetric Synthesis of Racemic Aliphatic Amino Acids  
by Circularly Polarized Light:  
Mechanism of pH- and Wavelength-Dependent Photolysis**

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円偏光シンクロトロン放射光によるアミノ酸の絶対不斉合成  
—pH および波長依存性—

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Origin of the homochirality in biomolecules is one of the most controversial issues in the chemical evolution on Earth. Bonner (*Orig. Life Evol. Biospher.* **1991**, *21*, 59) proposed that the enantiomeric enrichment can be achieved by the circularly polarized synchrotron radiation from a neutron star. This idea may be supported by the finding of optically active amino acids in the organic mantle of the Murchison meteorite (Engel, M. H.; Macko, S. A.; Silfer, J. A. *Nature* **1990**, *348*, 47).

In order to testify this hypothesis, we have performed the absolute asymmetric synthesis of some aliphatic amino acids in aqueous solutions at varying pH, by using left- and right-handed circularly polarized light generated by a newly developed polarizing undulator installed in an electron storage ring. The enantiomerically enriched sample (e.g. L isomer enrichment from *r*-CPL) was found to have occurred by the preferential excitation/decomposition of one enantiomer over another via a Norrish Type II mechanism (leucine, valine, and isoleucine), with the enantiomeric excess dependent on the degree of protonation of the amino/carboxylic acid moiety; see below. (Nishino, H.; Kosaka, A.; Hembury, G. A.; Shitomi, H.; Onuki, H.; Inoue, Y. *Org. Lett.* **2001**, *3*, 921). We will discuss the detailed mechanism of photodecomposition and the relationship between the enantiomeric enrichment of the amino acids and the solution pH (and the irradiation

wavelength) in the presentation.

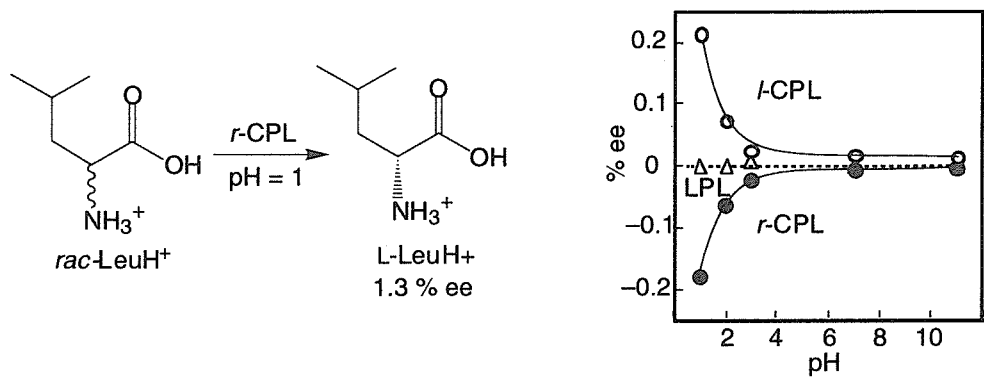


Figure. pH Dependence of the % ee of Leu irradiated with CPL at 215nm (Dose:  $60.3 \pm 0.3$  mAh): (○) *l*-CPL, (●) *r*-CPL, (△) LPL.