

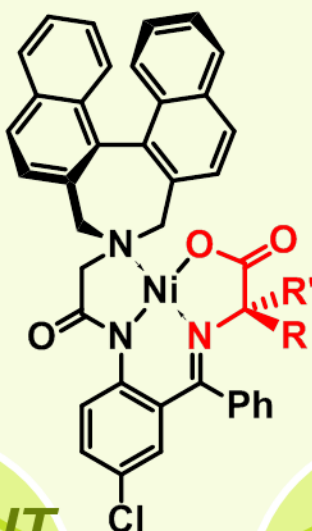
# ***Soloshonok-Hamari Ligand***

~Advanced Approach for  
Tailor-Made Amino Acids~

**REMARKABLE  
STEREOCHEMICAL  
OUTCOMES**

**EASY  
MANIPULATION**

**RECYCLABLE  
LIGAND**



**WITHOUT  
SPECIAL  
EQUIPMENT**

**COST  
EFFECTIVE**



**Hamari Chemicals, Ltd.**

# Practical Asymmetric Synthesis of Unnatural $\alpha$ -Amino Acids

Hamari Chemicals, Ltd. is collaborating with Professor Vadim A. Soloshonok to develop innovative synthetic process for unnatural amino acids. The **"Soloshonok-Hamari Ligand"** is an ideal tool to produce various unnatural amino acids at high efficiency.

Using these ligands and readily available racemic/natural amino acids, a variety of tailor-made unnatural amino acids can be synthesized with high stereoselectivity by chiral interconversion and/or functionalization at the  $\alpha$ -carbon position. These ligands do not racemize, and are easily recovered and recycled to permit cost-effective large scale manufacture.

**This technology is the ultimate advanced approach for tailor-made amino acids.**

## Advantages

### ① Remarkable Stereochemical Outcomes

Using "Soloshonok-Hamari Ligands," various unnatural amino acids can be prepared at both high optical purity and high yield, which is often difficult to attain by enzymatic or resolution methods.

### ② Easy Manipulation

The Nickel (II) complex prepared from the Schiff base of a "Soloshonok-Hamari Ligand" and the amino acid is a stable crystal, and is easily isolated by filtration.

### ③ Recyclable Ligand

"Soloshonok-Hamari Ligands" do not racemize, and can be easily separated from the unnatural amino acid product and quantitatively recycled.

### ④ Without Special Equipment

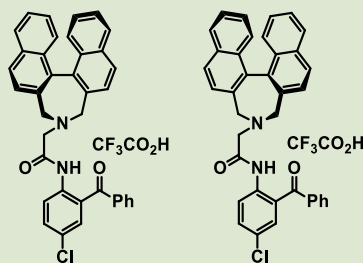
"Soloshonok-Hamari Ligand" technology does not require special equipment like cryogenic reactors or autoclaves.

### ⑤ Cost Effective

Scale-up is very easy. We can propose various options for your custom-made manufacturing of unnatural amino acids, based on our 60 years of experience in laboratory and process chemistry.

## "Soloshonok-Hamari Ligand" and Ni(II) complexes of Glycine/Alanine Schiff Base

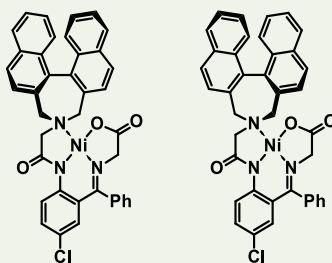
For S/R Interconversion



(S)-BCCN  
TFA salt

(R)-BCCN  
TFA salt

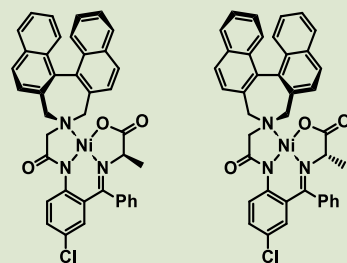
For Asymmetric Functionalization



(S)-BCNG

(R)-BCNG

For  $\alpha,\alpha$ -Disubstituted Amino Acids



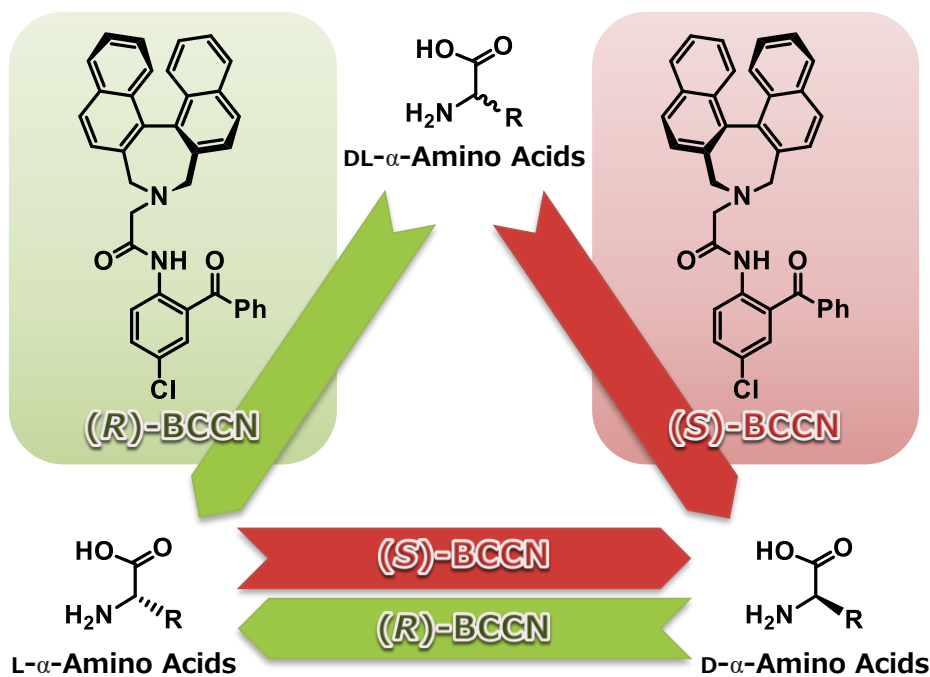
(S)-BCNA

(R)-BCNA

Please contact us for price and availability of complexes not shown above. We can make tailor-made complexes with a minimum order of 500 mg.

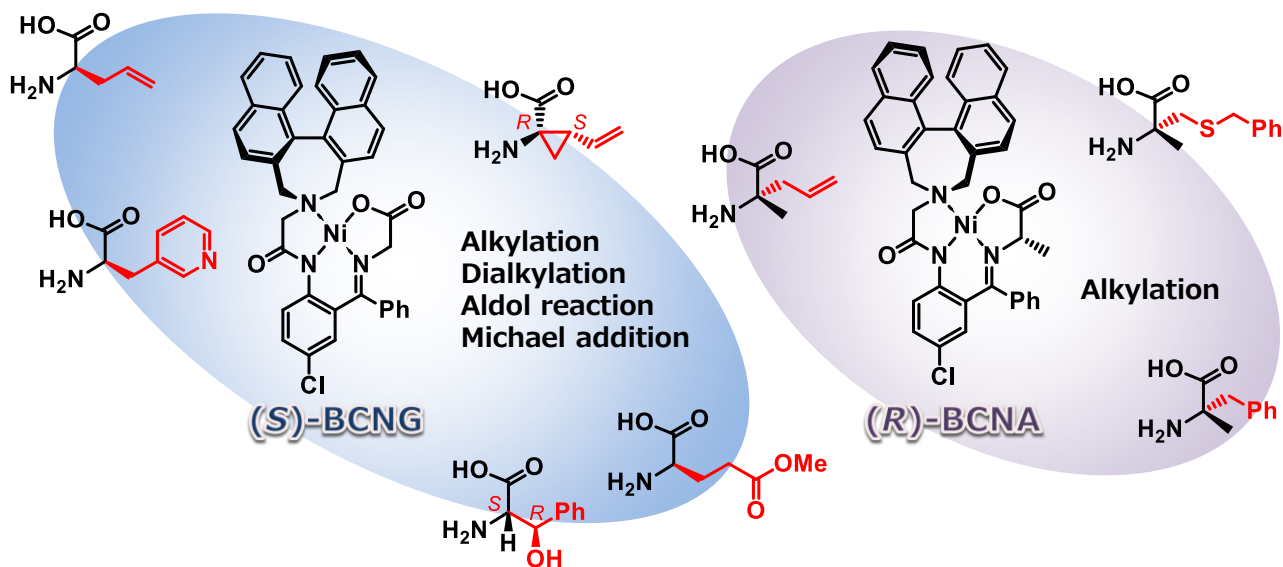
# S/R Interconversion of Amino Acids

With "Soloshonok-Hamari Ligands," a racemic mixture of  $\alpha$ -amino acids can be converted to pure D- or L-amino acids. Moreover, these ligands also make it feasible to convert natural D-amino acids to L-amino acids. **Chiral D-amino acids are extremely useful in R&D and in designing new peptide pharmacophores.**



## Asymmetric Functionalization

Glycine can be converted to unnatural amino acids through derivatization of the Nickel (II) complex prepared from "Soloshonok-Hamari Ligand" and glycine. Similarly  $\alpha,\alpha$ -disubstituted amino acids can be prepared from Alanine-Nickel complex. **Thus, various functionalized amino acids are available with high optical purity using our ligand.**



# Research Activities

## Patents

**Axial-asymmetric *N*-(2-acylaryl)-2-[5, 7-dihydro-6*H*-dibenzo [c, e] azepine-6-yl] acetamide compound and chirality conversion method for  $\alpha$ -amino acid using same** WO2014098063A1

**Method for synthesizing optically active  $\alpha$ -amino acid using chiral metal complex comprising axially chiral *N*-(2-acylaryl)-2-[5, 7-dihydro-6*H*-dibenzo [c, e] azepin-6-yl] acetamide compound and amino acid** WO2014188783A1

## Publications

### **Chemical Dynamic Kinetic Resolution and *S/R* Interconversion of Unprotected $\alpha$ -Amino Acids**

*Angew. Chem. Int. Ed.* **2014**, 53, 12214–12217

*ACS Omega* **2018**, 3, 9729–9737; *Org. Biomol. Chem.* **2018**, 16, 4968–4972; *Chirality* **2018**, 30, 498–508; *Curr. Pharm. Des.* **2017**, 23, 4493–4554; *Org. Biomol. Chem.* **2017**, 15, 6978–6983; *Amino Acids* **2017**, 49, 1487–1520; *Org. Process Res. Dev.* **2017**, 21, 732–739; *Eur. J. Org. Chem.* **2017**, 1931–1939; *Eur. J. Org. Chem.* **2016**, 2757–2774; *Amino Acids* **2016**, 48, 973–986; *Eur. J. Org. Chem.* **2016**, 999–1006; *J. Org. Chem.* **2015**, 80, 9817–9830; *RSC Adv.* **2015**, 5, 1051–1058; *J. Fluorine Chem.* **2015**, 171, 67–72; *Org. Biomol. Chem.* **2014**, 12, 6239–6249; *Adv. Synth. Catal.* **2014**, 356, 2203–2208; *Amino Acids* **2014**, 46, 2047–2073; *Amino Acids* **2014**, 46, 945–952; *Beilstein J. Org. Chem.* **2014**, 10, 442–448; *Amino Acids* **2013**, 45, 1017–1033; *Amino Acids* **2013**, 45, 691–718; *J. Fluorine Chem.* **2013**, 155, 21–38; *J. Fluorine Chem.* **2013**, 152, 114–118; *Org. Biomol. Chem.* **2013**, 11, 4508–4515; *Org. Biomol. Chem.* **2013**, 11, 4503–4507

## Partner and Advisor

### **Prof. Dr. Vadim A. Soloshonok**



- Ikerbasque Research Professor of University of the Basque Country, UPV/EHU in San Sebastian
- More than 20 years of research on asymmetric synthesis of amino acids in Ukrainian, Italian, Japanese, USA and Spanish Universities
- Over 300 publications; h-index 75 (as of March 2019)

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