Bioorganic Chemistry - Organoelement Chemistry -

Prof  
TOKITOHI, Norihiro  
(D Sc)

Assoc Prof  
NAKAMURA, Kaoru  
(D Sc)

Instr  
SUGIYAMA, Takashi  
(D Sc)

Instr  
KAWAI, Yasushi  
(D Sc)

Students  
HAYASHI, Motoko (DC3)  
ITOH, Kenji (DC3)  
SASAMORI, Takahiro (DC3)  
YAMAGUCHI, Hitomi (DC3)  
NAGATA, Kazuto (DC2)  
NAKATA, Norio (DC2)  
YAMANAKA, Rio (DC2)  
HORI, Mariko (MC2)  
KAJIWARA, Takashi (MC2)  
SHINOHARA, Akihiro (MC2)  
KIMURA, Satoshi (MC1)  
MIZUHATA, Yoshiyuki (MC1)

Instr  
TAKEDA, Nobuhiro  
(D Sc)

Assoc Instr  
YAMAZAKI, Norimasa  
(D Sc)

Techn  
HIRANO, Toshiko

Scope of Research

Organic chemistry has been developed as that of second-row elements such as carbon, oxygen, and nitrogen so far, while the synthesis and isolation of the heavier congeners of typical organic molecules as stable compounds have been one of “dreams” for organic chemists. Our main research interest is the elucidation of the resemblance and difference in structures and reactivities between organic compounds and the corresponding heavier congeners. These studies are interesting from the standpoints of not only fundamental chemistry but also opening the way to more extensive application of main group chemistry. Organic synthesis mediated by biocatalysts are also studied.

Research Activities (Year 2001)

Presentations


Synthesis and reactivity of low-coordinated compounds containing group 15 elements, Sasamori T, Takeda N, Tokitoh N, XVth Int. Conference on Phosphorus Chem., 31 Jul. Other 4 papers were presented.

Synthesis and reactivity of platinum-dichalcogenido complexes, Nagata K, Takeda N, Tokitoh N, XVth Int. Conference on Phosphorus Chem., 2 Aug. Other 3 papers were presented.


Others, 16 papers were presented.

Grants

Tokitoh N, Systematic studies on the synthesis, structures, and properties of aromatic compounds containing heavier group 14 elements, Grant-in-Aid for Scientific Research (A) (2), 1 Apr 1999 - 31 Mar 2002.


Kawai Y, Studies on the novel enzymatic reaction mechanisms taking into account the enzyme fluctuations, Grant-in-Aid for Scientific Research (C) (2), 1 Apr 2000 - 31 Mar 2002.

Synthesis and properties of compounds having novel structure containing heavier group 14 elements

In recent decades, the chemistry of compounds having novel structure containing heavier group 14 elements has been extensively studied. We have developed novel steric protection groups, 2,4,6-tris[bis(trimethylsilyl)methyl]phenyl (Tbt) and 2,6-bis[bis(trimethylsilyl)methyl]-4-[tris(trimethylsilyl)methyl]phenyl (Bbt), which are very useful for the kinetic stabilization of various highly reactive species of main group elements.

We succeeded in the synthesis of the first stable 2-germanaphthalene, 9-silaanthracene, germacyclopropabenzene, and silylborane-isocyanide complexes by taking advantage of Tbt group, and elucidated their interesting properties. Especially, it is noteworthy that the 2-germanaphthalene is the first neutral germaraomatic compound.

Synthesis of the first stable phosphorus-bismuth double-bond compound

In recent years there has been much interest in compounds with a double bond between heavier group 15 elements. However, there is no heteronuclear doubly bonded system between phosphorus and bismuth, i.e., phosphabismuthene. We now report the synthesis of the first stable phosphabismuthene by taking advantage of the Bbt group, which is also effective for the synthesis of distibene, dibismuthene, and stibabismuthene.

Condensation of Mes\(^*\)PH\(_2\) with BbtBiBr\(_2\) using 1,8-diazabicyclo[5.4.0]undec-7-ene as a base afforded the first stable phosphabismuthene Mes\(^*\)P=BiBbt, which is also the first stable double-bond compound between the third and sixth row main group elements.

Synthesis and properties of the first platinum-dichalcogenido complexes

Much attention has been paid to transition metal complexes with a disulfur or diselenium ligand, which are heavier congeners of well-studied dioxygen complexes. However, the platinum complexes with disulfur and diselenium (i.e., PtE\(_2\) ring systems) remain unknown.

The first platinum disulfur and diselenium complexes have been synthesized by taking advantage of new bulky phosphine ligands ArMe\(_2\)P (Ar = Tbt or Bbt). These complexes have a square planar geometry and a three-membered PtE\(_2\) (E = S, Se) ring.

Awards

Nakata N, Symposium Poster Award, 6th Symposium of the Soc. of Silicon Chem., Jpn., Reactivity of kinetically stabilized 2-germanaphthalene, the Soc. of Silicon Chem., Jpn., 16 Nov.


