Prof. Shigeru Yamago

K. Günther

- 1986 Undergraduate, Tokyo Institute of Technology (Prof. E. Nakamura)
- 1988 Summer Student, University of California (Prof. P. Vollhardt)
- 1991 Ph. D., Tokyo Institute of Technology (Prof. E. Nakamura)
- 1991–1995 Assistant Professor, Tokyo Institute of Technology
- 1995–2003 Assistant Professor, Kyoto University (Prof. J. Yoshida)
- 2000 Visiting Scientist, Consiglio Nazionale delle Ricerche
- 2003–2006 Professor, Osaka City University
- 2006–present Professor, Kyoto University

- 2002–2006 Research Fellow of PRESTO programm in JST
- 2010–present Principal Investigator of CREST programm in JST

- Numerous Academic Prizes:
  2001 Incentive Award in Synthetic Organic Chemistry (SSOCJ)
  2012 DIC Functional Materials Award (SSOCJ)
  2012 Ichimura Academic Award

- More than 210 scientific Publications (Scopus, 2020)

- *h*-index 49

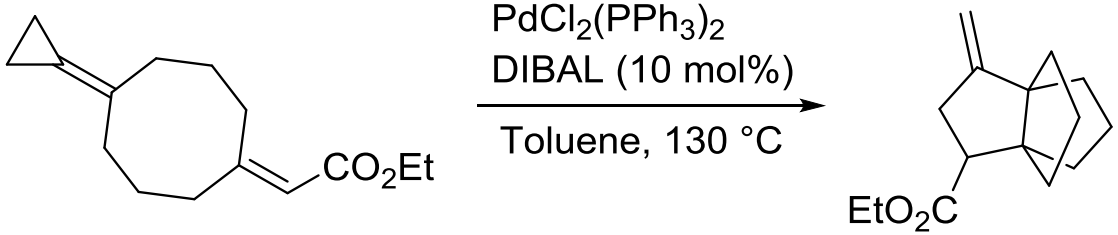
http://os.kuicr.kyoto-u.ac.jp/prof.html

Doctoral supervisor Eiichi Nakamura

- Synthetic organic chemist
- Functionalization of Carbon Clusters
- Transition metal catalysis
- Mechanism of Organic/Organometall Reactions

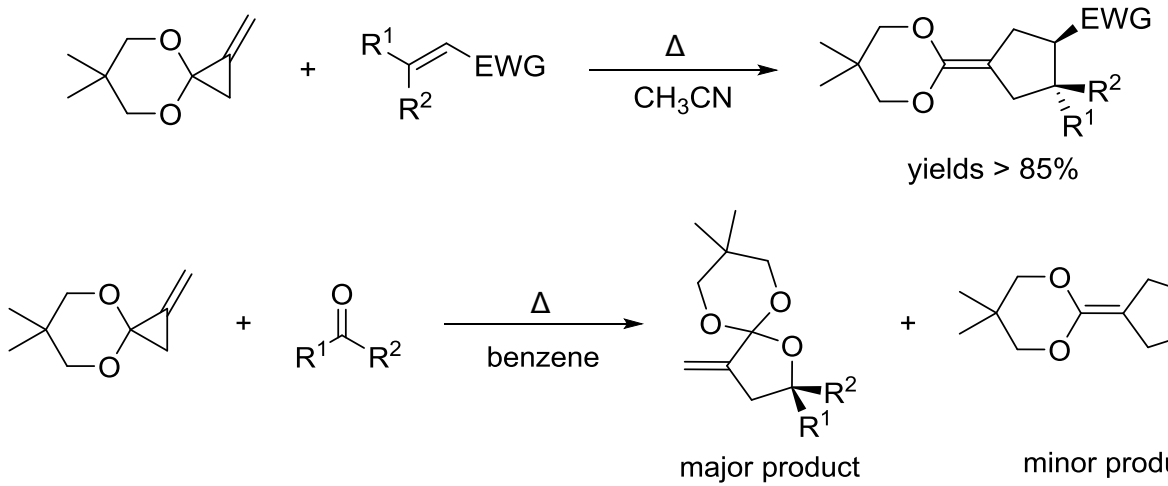
http://www.chem.s.u-tokyo.ac.jp/users/common/NakamuraLabE.html

Propellane synthesis by exocyclic cycloaddition



S. Yamago, E. Nakamura; J. *Chem. Soc., Chem. Commun.* **1988**, 1112–1113.

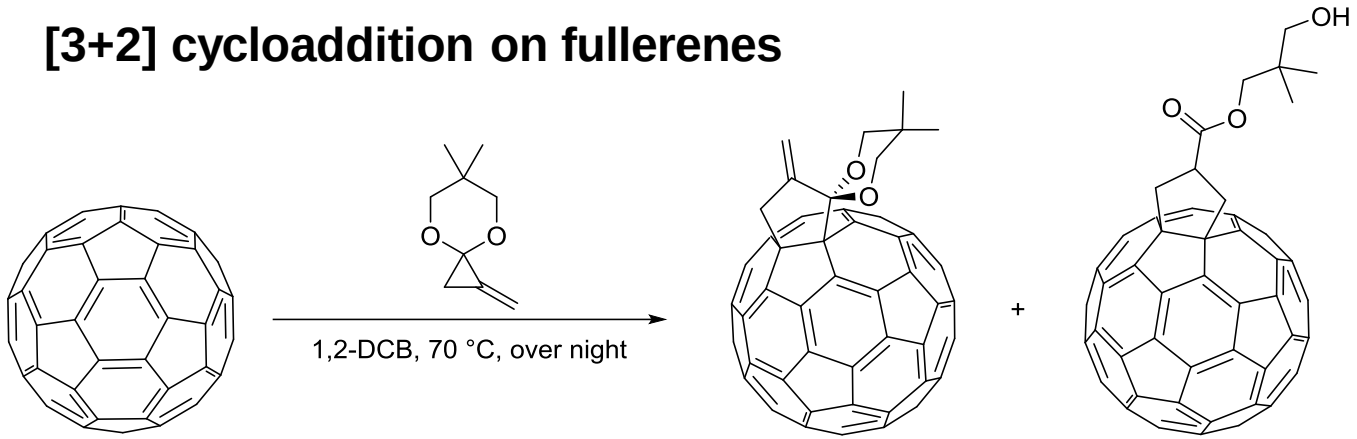
[3 + 2] thermal cycloaddition



S. Yamago, E. Nakamura, *J. Am. Chem. Soc.*. **1989**, *111*, 7285–7286.

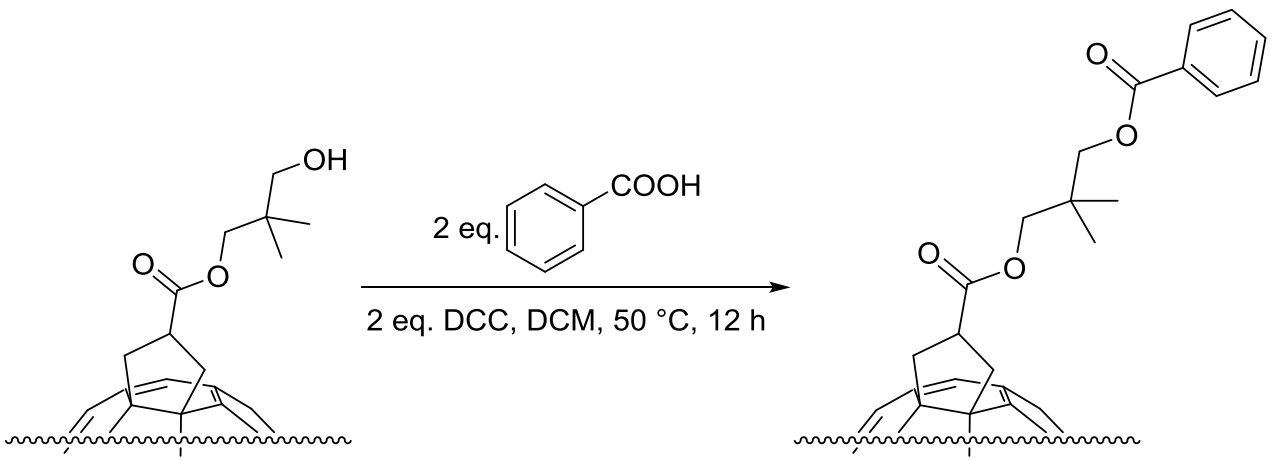
S. Yamago, E. Nakamura, *J. Org. Chem.* **1990**, *55*, 5555–5558.

[3+2] cycloaddition on fullerenes



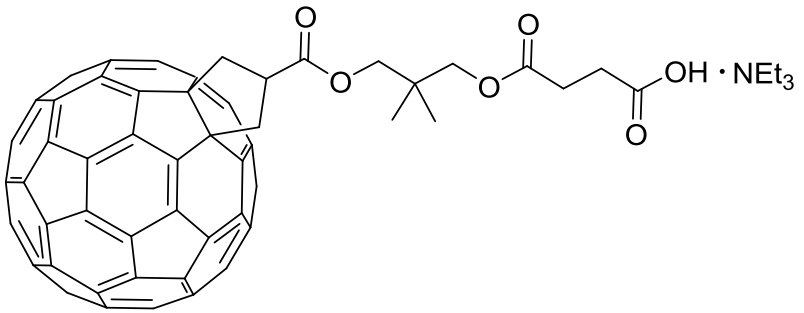
M. Prato, T. Suzuki, H. Foroudian, Q. Li, K. Khemani, F.Wudl, J. Leonetti, R. D. Little, T. White, B. Rickborn ,S. Yamago, E. Nakamura; *J. Am. Chem. Soc.* **1993**, *115*, 1595–1597.

Derivatization of Organofullerenes

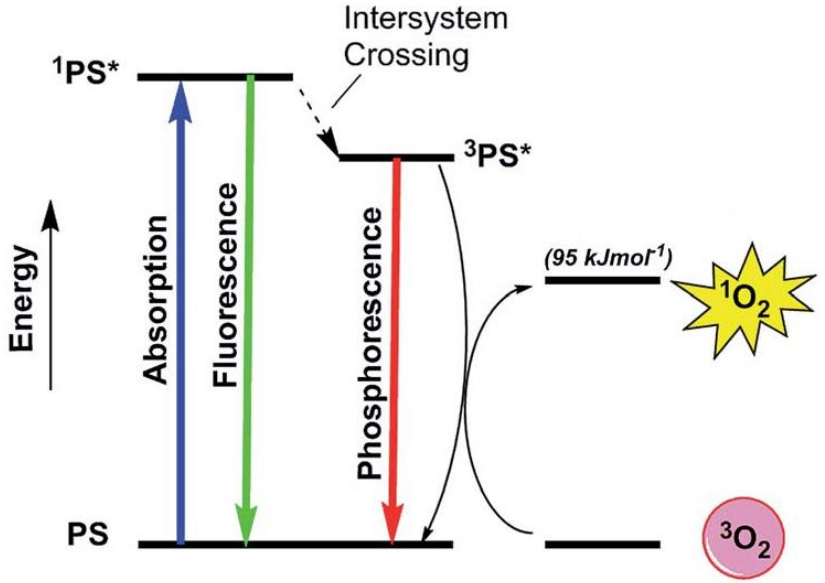


S. Yamago, H. Tokuyama, E. Nakamura, M. Prato, F.Wudl; *J.Org. Chem.* **1993**, *58*, 4796–4798.

Biochemical activity of fullerene derivates



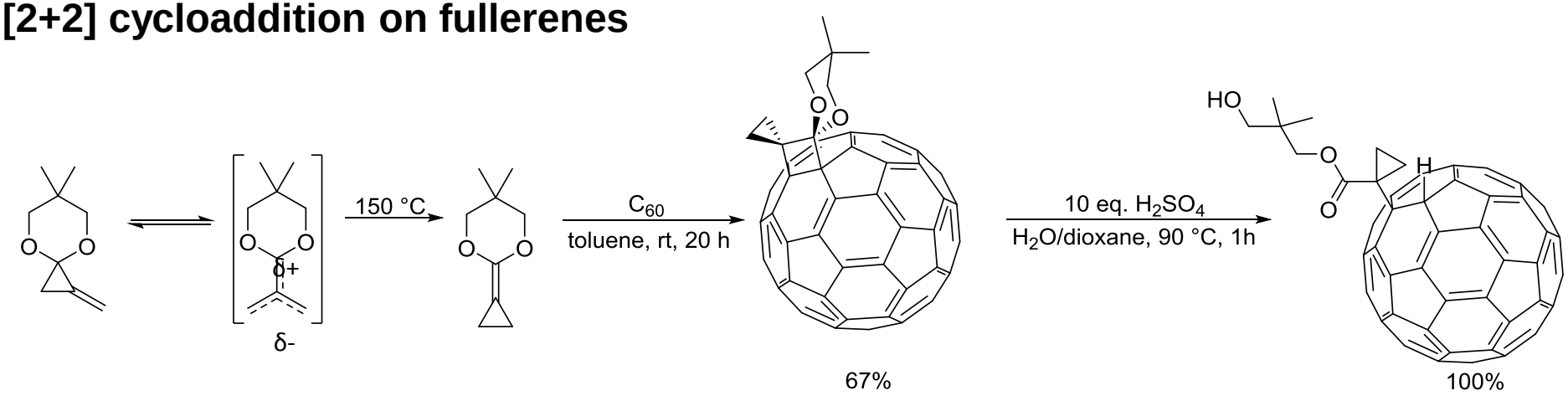
- Ability to cleavage DNA by generating Singlett-Oxygen



H. Tokuyama, S. Yamago, E. Nakamura, T. Shiraki, Y. Sugiura; *J. Am. Chem. Soc.* **1993**, *58*, 7918–7919.

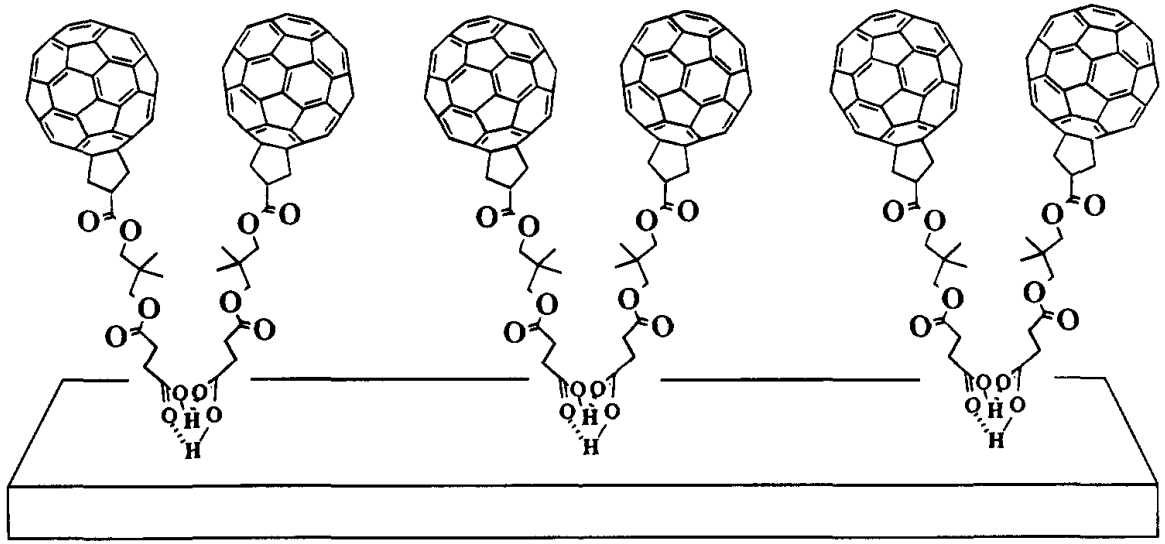
Z. Li, K. B. Grant; *RSC Adv.* **2016**, *6*, 24617–24634.

[2+2] cycloaddition on fullerenes



S. Yamago, A. Takeichi, E. Nakamura; *J. Am. Chem. Soc.* **1994**, *116*, 1123–1124.

Dimerization on Langmuir-Blodgett Film

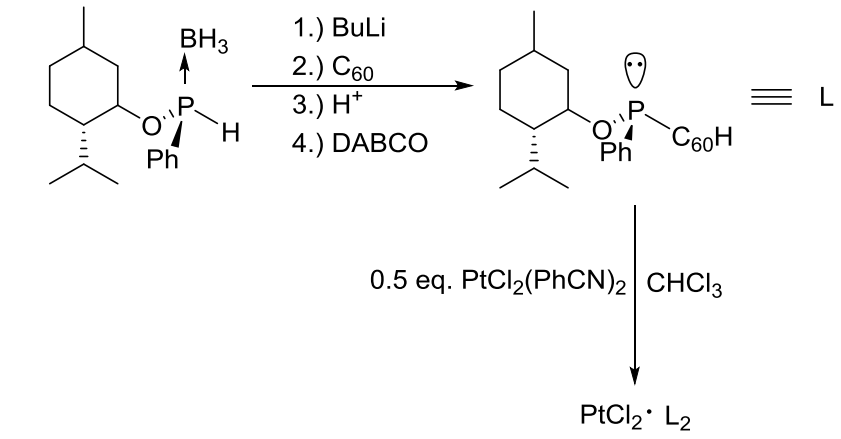


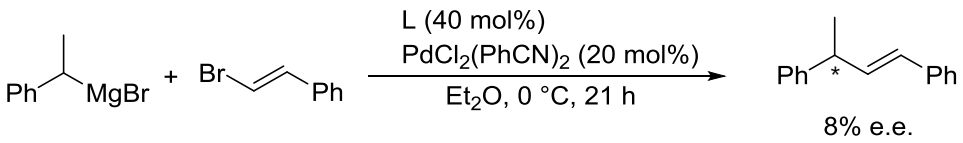
M. Matsumoto, H. Tachibana, R. Azumi, M. Tanaka, T. Nakamura, G. Yenome, M. Abe, S. Yamago, E. Nakamura, *Langmuir* **1995**, *11*, 660–665.

Prof. Shigeru Yamago

As Assistant Professor at Kyoto University Yamago starts to work on different topics.

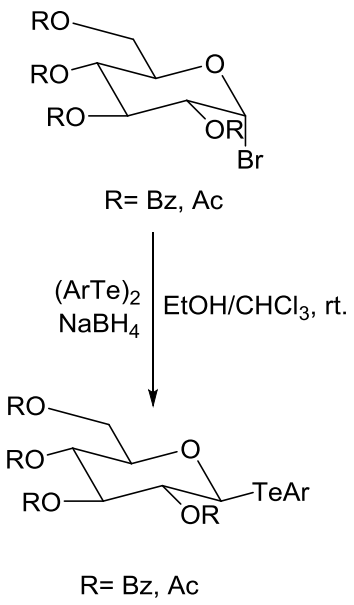
Fullerene substituent Phosphorus ligands





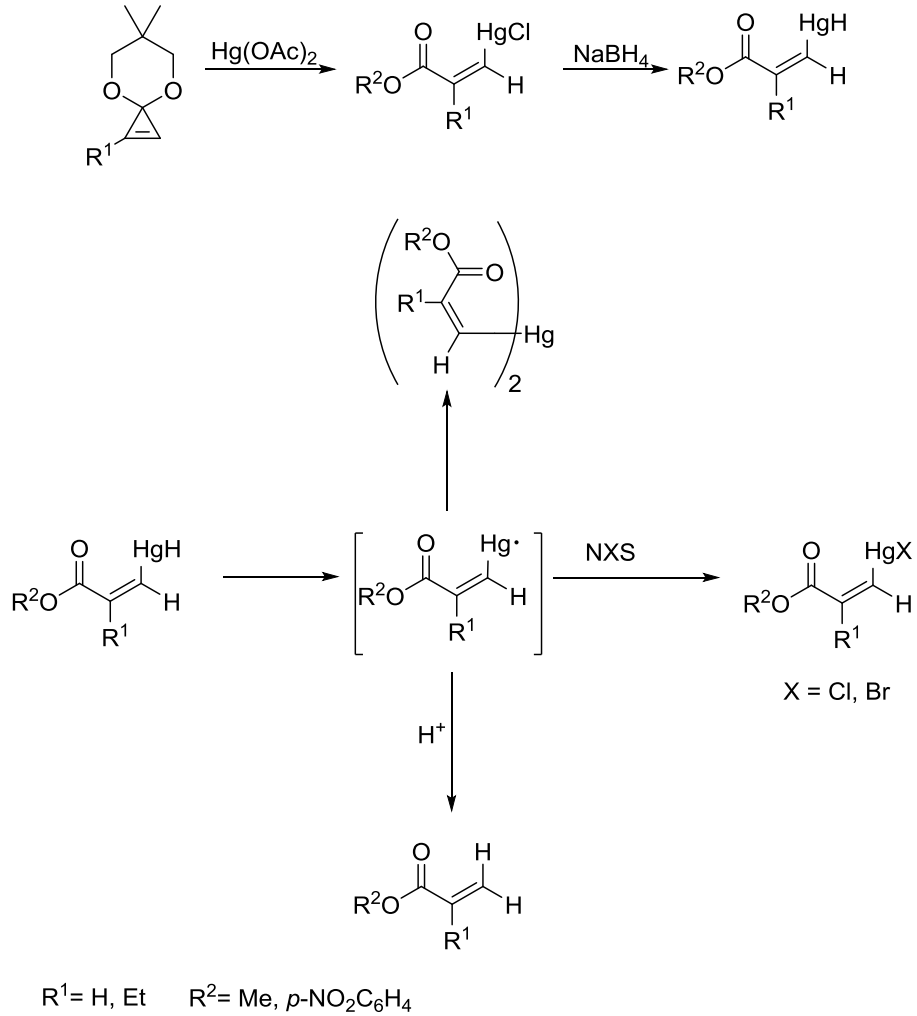
<u>S. Yamago, M. Yanagawa, H. Mukai, E. Nakamura; *Tetrahedron* **1996**, *52*, 5091–5102.</u>

Telluroglycosides



<u>S. Yamago, K. Kokubo, K. Masuda, E. Nakamura; *Synlett* **1996**, *9*, 929–930.</u>

Radical reactions

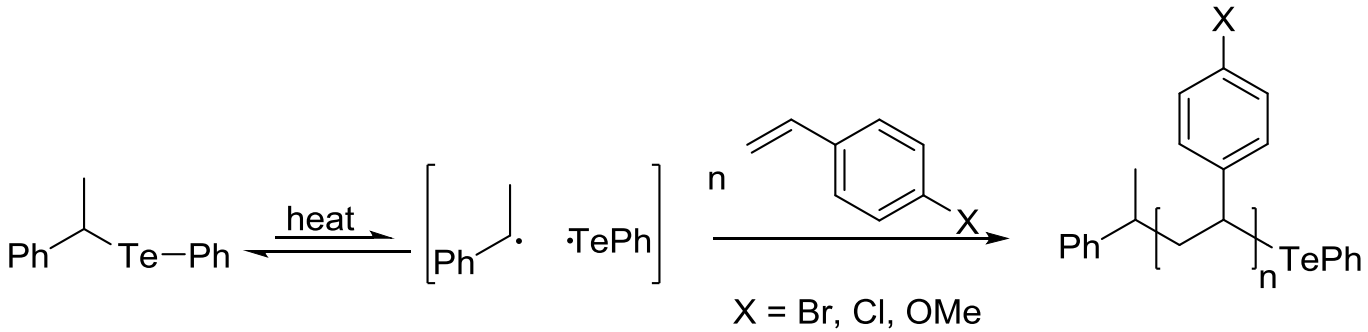


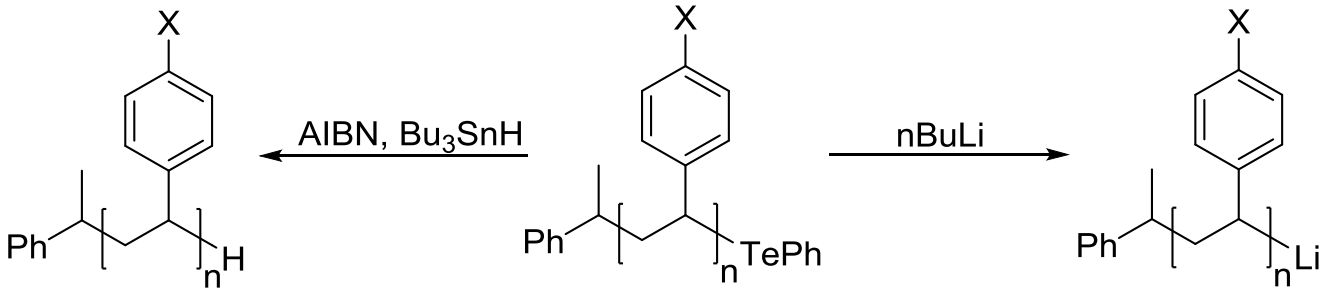
R^1= H, Et R^2= Me, *p*-$NO_2C_6H_4$

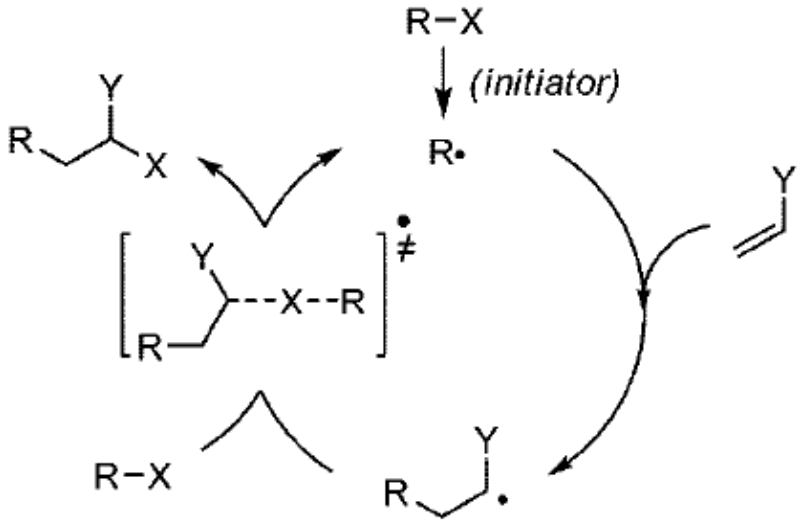
<u>E. Nakamura, Y. Yu, S. Mori, S. Yamago; *Angew. Chem. Int. Ed. Engl.* **1997**, *36*, 374–376.</u>

- In this time Yamago published over 15 papers about Organotellurium compounds and them affecting radical reactions

Organotellurium-mediated living radical polymerization (TERP)







Advantages:

- molecular weight control
- defined end-groups
- later functionalization

Similar work with Organostibines and Organobismuthines

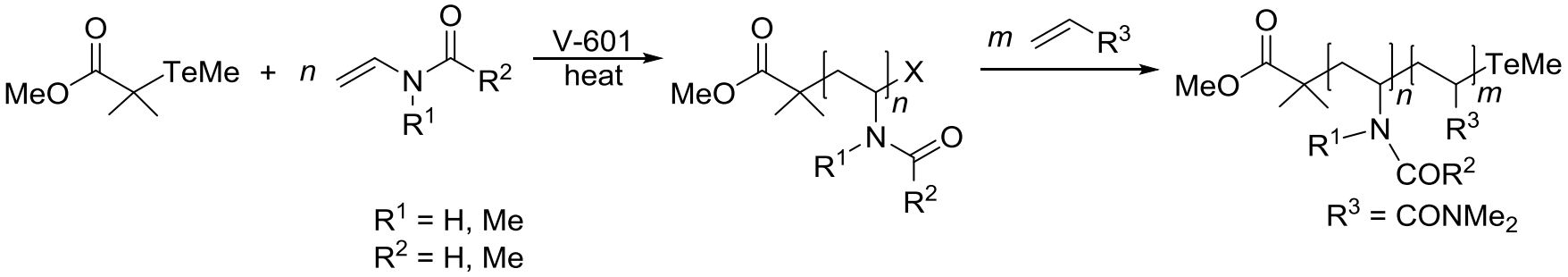
S. Yamago, K. Iida, J. Yoshida; *J. Am. Chem. Soc.* **2002**, *124*, 2874–2876.

S. Yamago, K. Iida, M. Nakajima, J. Yoshida; *Macromolecules* **2003**, *36*, 3793–3796.

Y. Sugihara, Y. Kagawa, S. Yamago, M. Okubo; *Macromolecules* **2007**, *40*, 9208–9211.

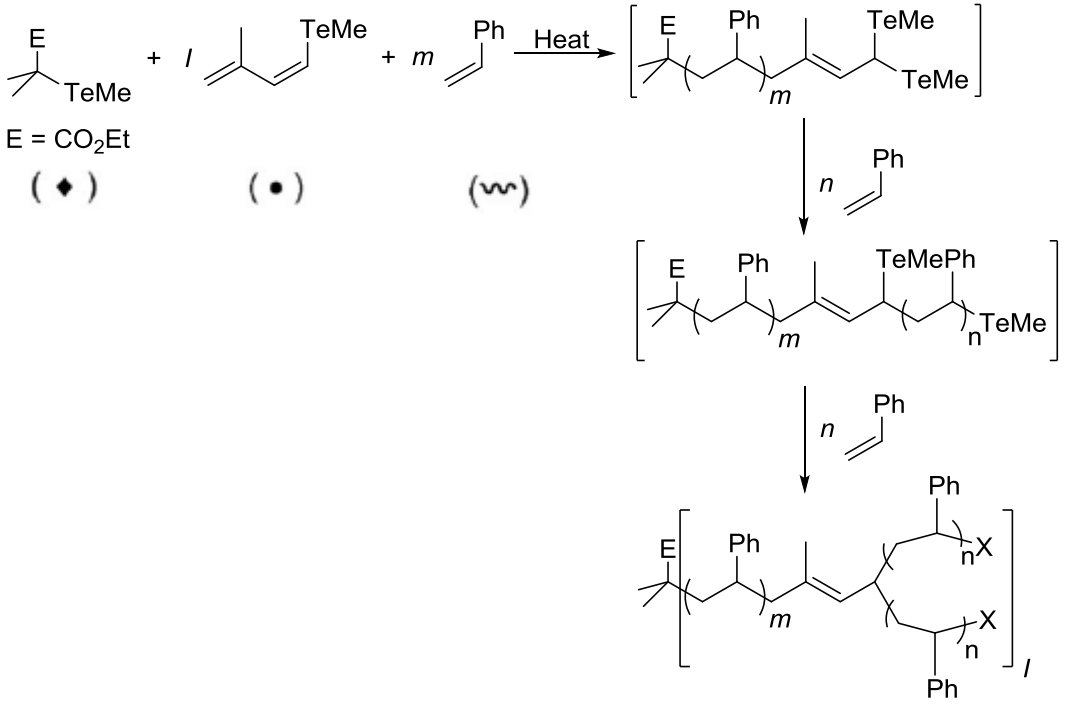
E. Mishima, S. Yamago; *J. Polym. Sci* **2012**, *50*, 2254–2264.

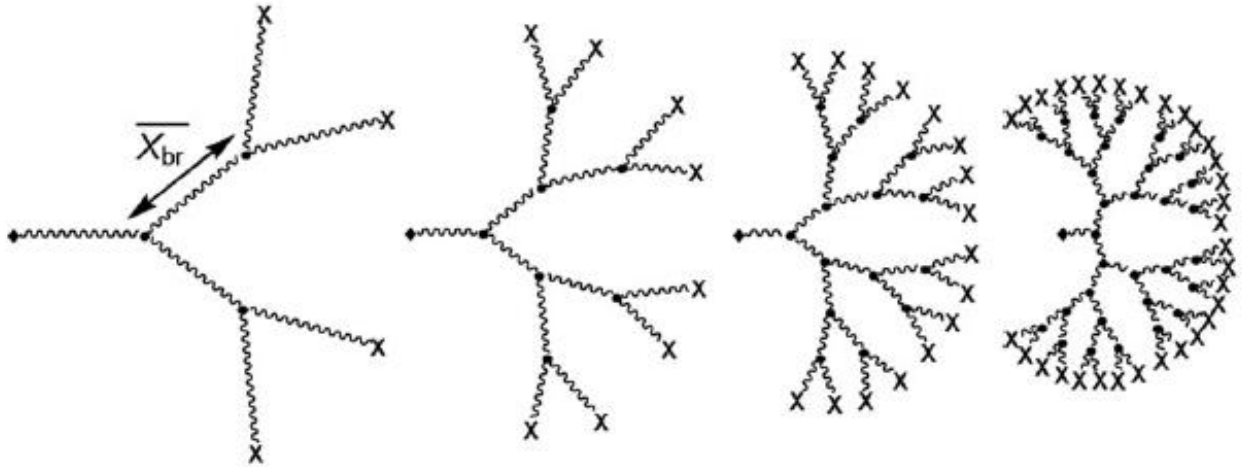
Synthesis Poly(*N*-vinylamide) and Poly(vinylamine)



W. Fan, S. Yamago; *Angew. Chem. Int. Ed. Engl.* **2019**, *58*, 7113–7116.

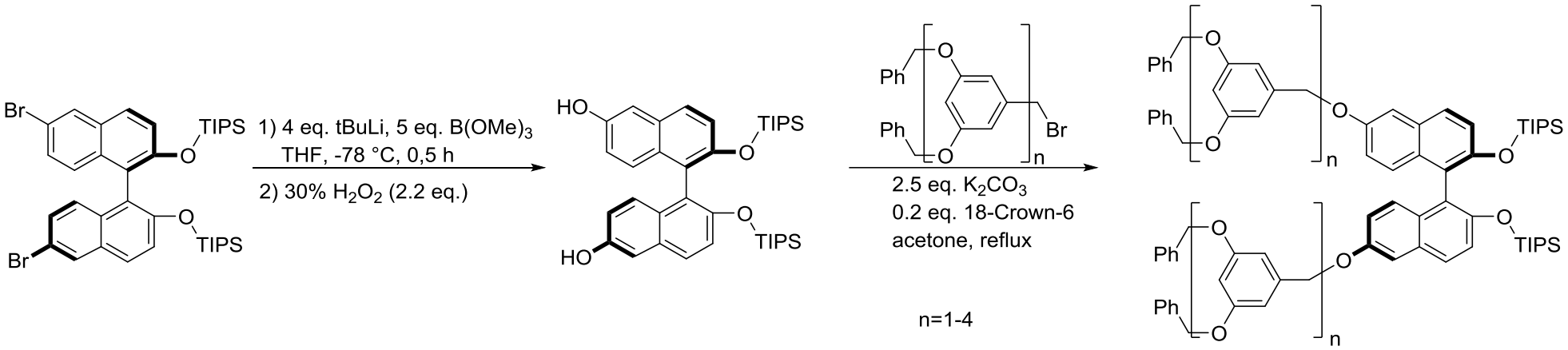
Dendritic Polystyrenes

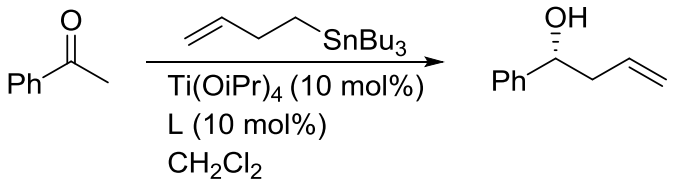




Y. Lu, S. Yamago; *Angew. Chem. Int. Ed. Engl.* **2019**, *58*, 3952–3956.

Optical active Ligands for asymmetric catalysis

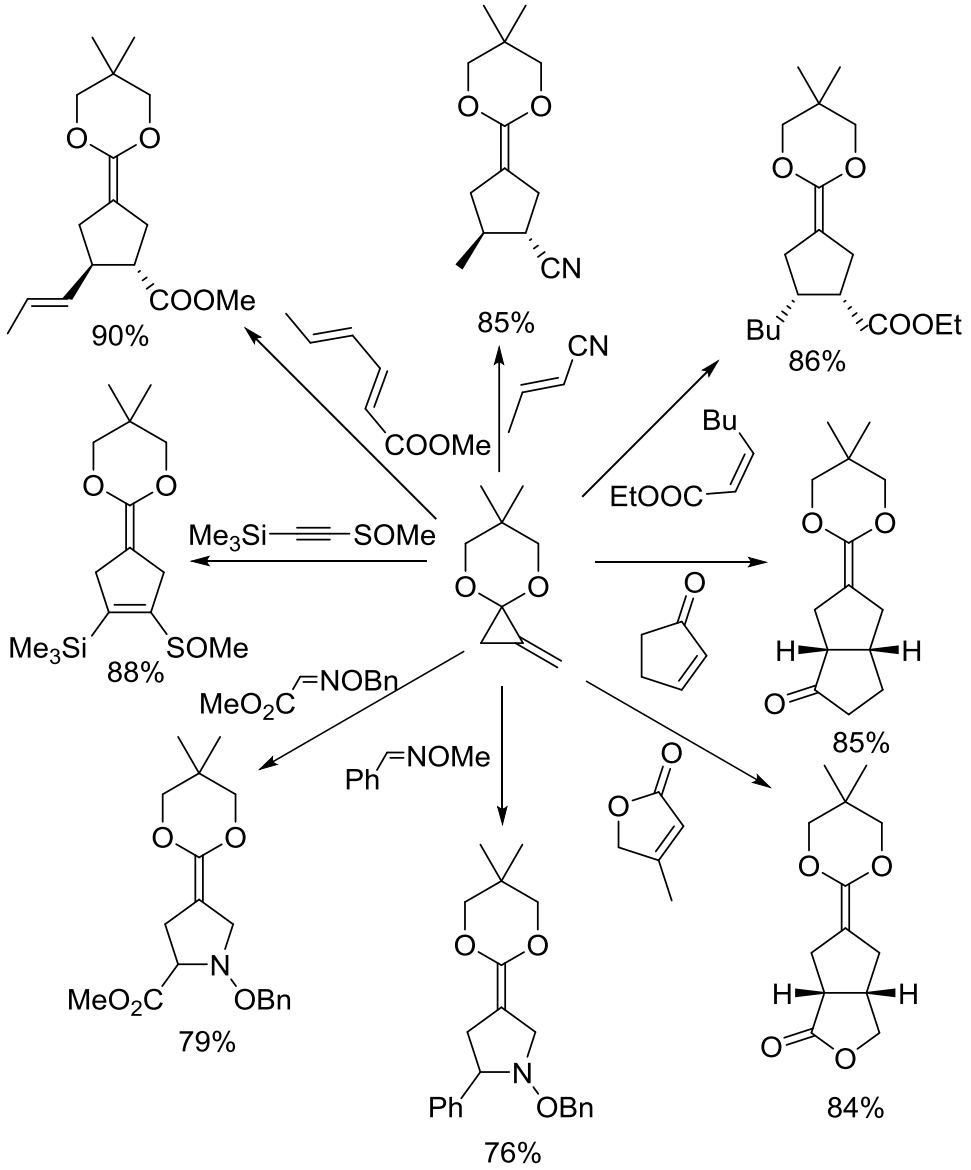




L	yield %	*ee*%
n=1	18	92
n=2	36	89
n=3	36	88
(*R*)-binapthol	31	87

S. Yamago, M. Furukawa, H. Mukai, A. Azuma, J. Yoshida; *Tetrahedron Letters* **1998**, *39*, 3783–3786.

- In Addition to his work on Organotellurides, he still works on his basic building block

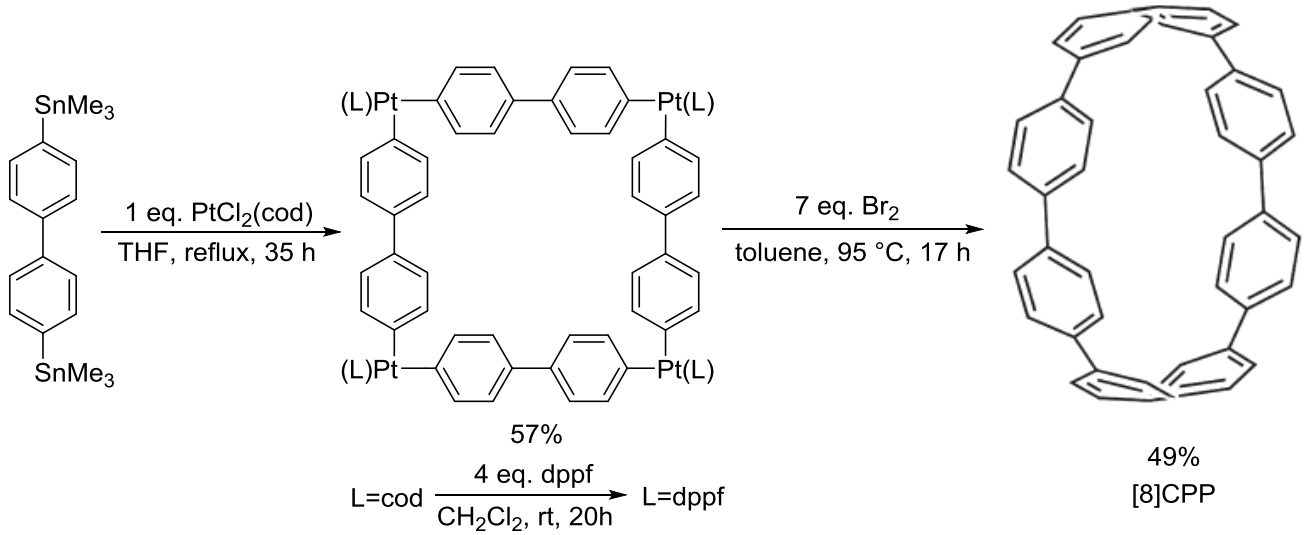


E. Nakamura, S. Yamago; *Acc. Chem. Res.* **2002**, *35*, 867–877.

Prof. Shigeru Yamago

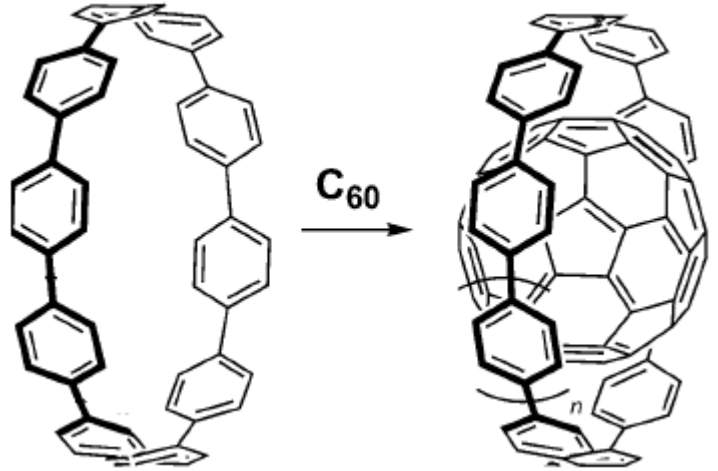
- Besides his work on Organotellurides, he starts to work on Cyclo-*para*-Phenylenes (CPPs)

[8]CPP synthesis via tetranuclear platinumcomplex



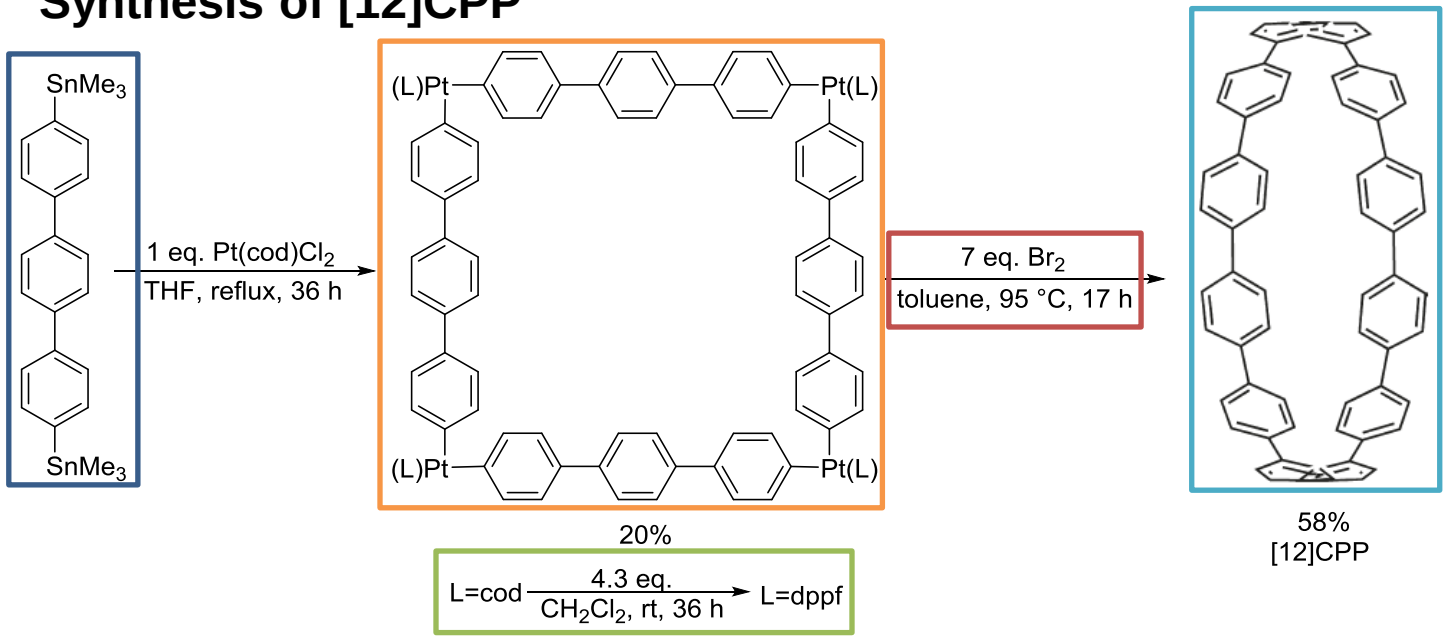
S. Yamago, Y. Watanabe, T. Iwamoto; *Angew. Chem. Int. Ed.* **2010**, *49*, 757–759.

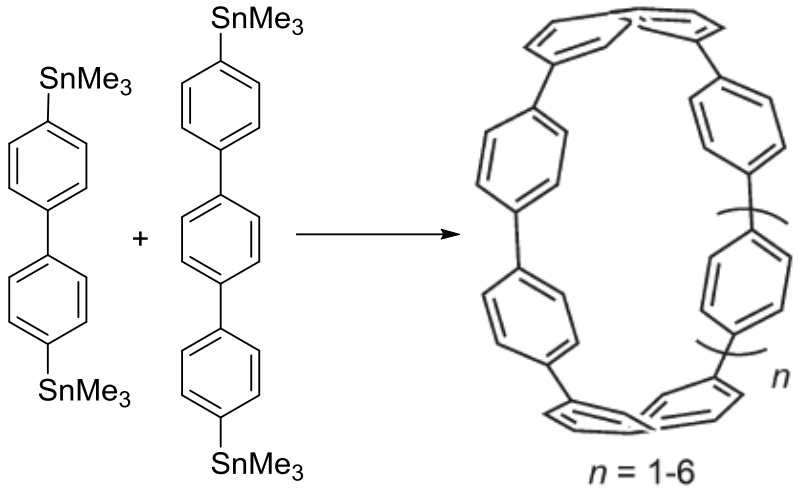
Fulleren encapsulated in 10[CPP]



T. Iwamoto, Y. Watanabe, T. Sadahiro, T. Haino, S. Yamago; *Angew. Chem. Int. Ed.* **2011**, *50*, 8342–8344.

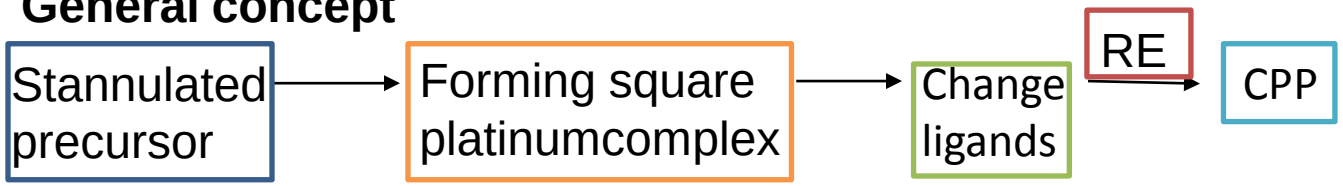
Synthesis of [12]CPP





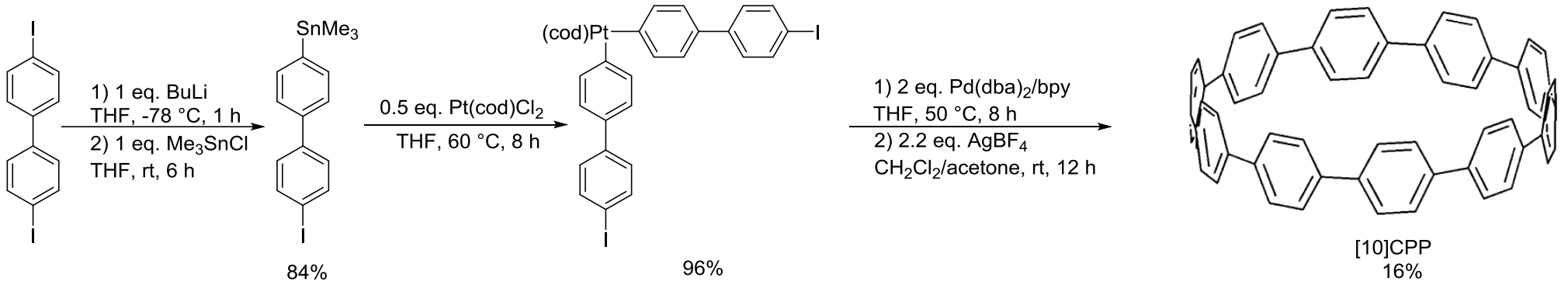
Unselective synthesis of [8-12]CPP using different precursors

General concept

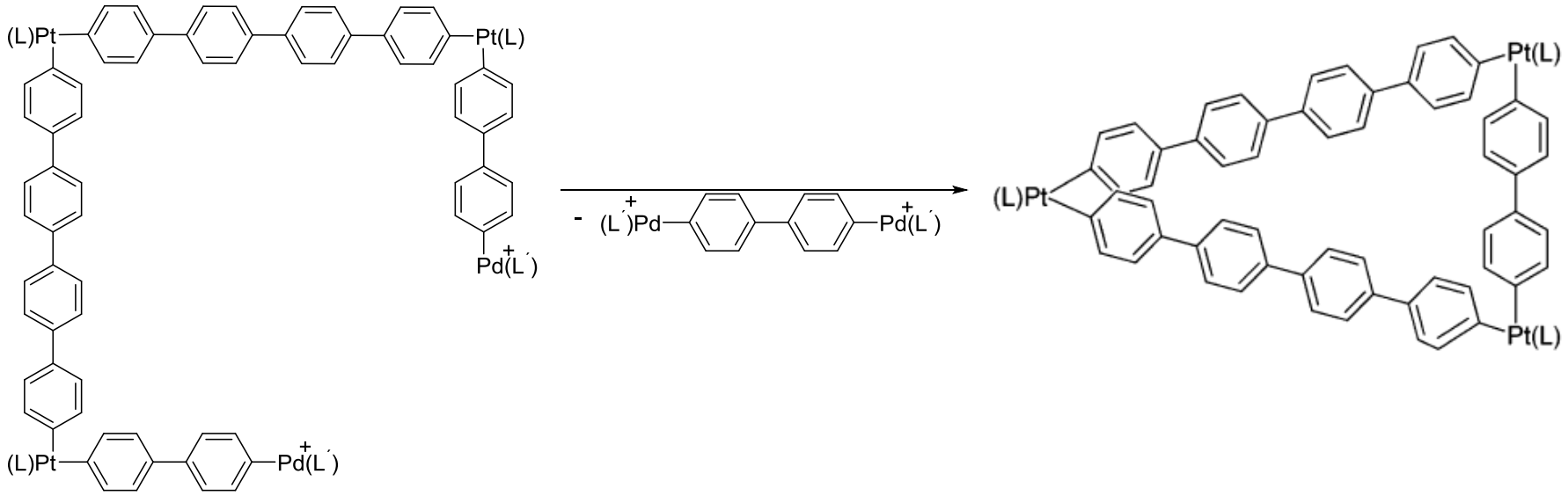


T. Iwamoto, Y. Watanabe, Y. Sakamotp, T. Suzuki, S. Yamago ; *J. Am. Chem. Soc.* **2011**, *133*, 8354–8361.

Selective Synthesis of [10]CPP

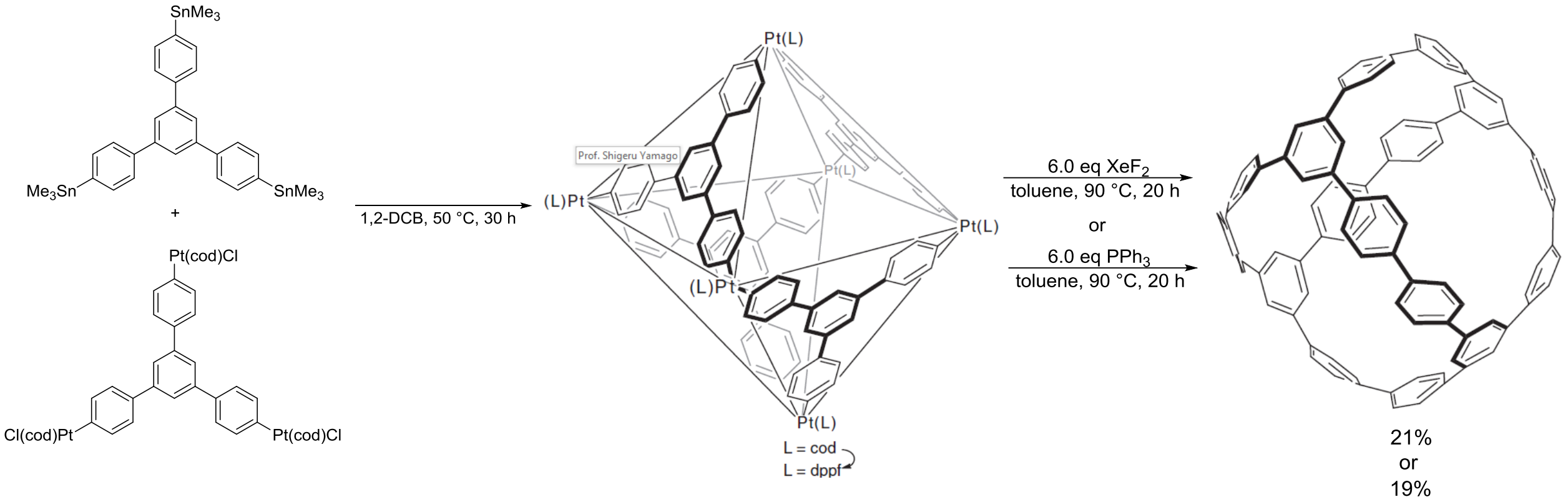


Proposed mechanism:



E. Kayahara, Y. Sakamoto, T. Suzuki, S. Yamago; *Org. Lett.* **2012**, *14*, 3284–3287.

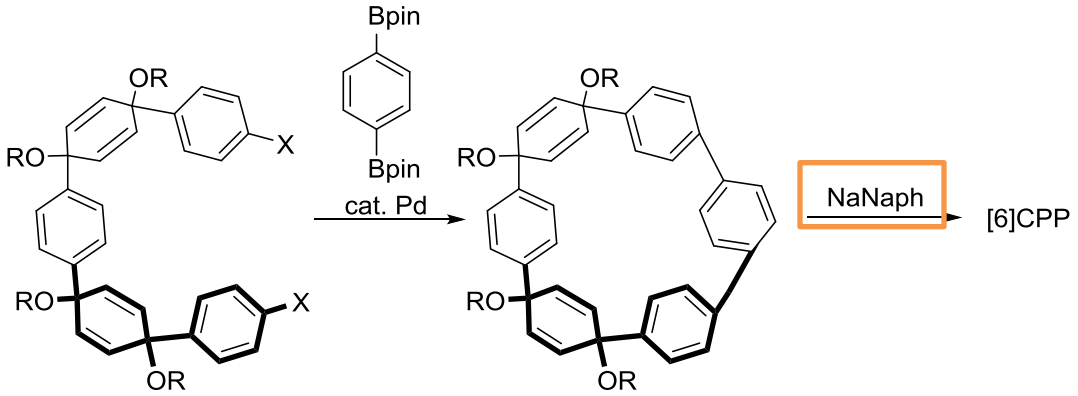
Synthesis of ball-like three-dimensional *π*-conjugated molecule



E. Kayahara, T. Iwamoto, H. Takaya, T. Suzuki, M. Fujisuka, T. Majima, N. Yasuda, N. Matsuyama, S. Seki, S. Yamago; *Nature Commun.* **2013**, *4*, 2694.

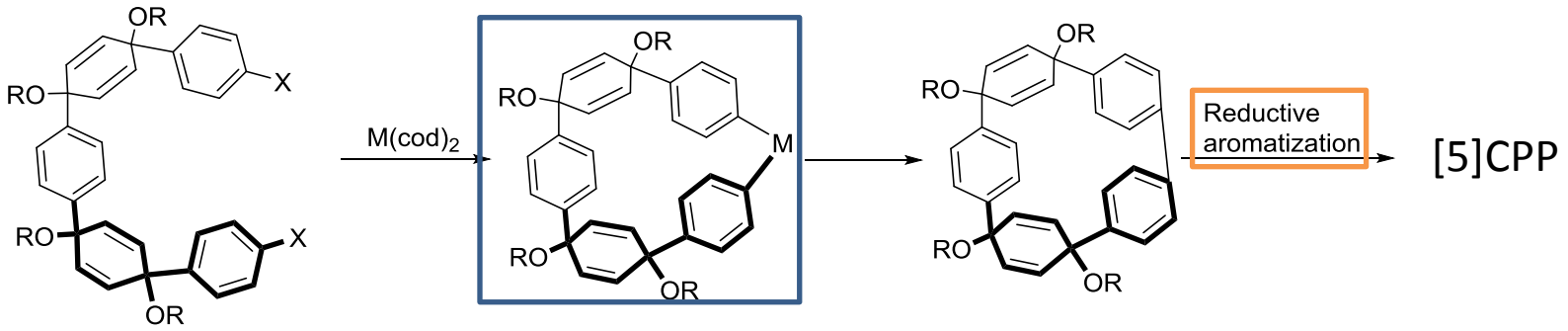
Synthesis of [5]CPP

Jasti and Bertozzi approach for CPPs



R = Me, X = Br

Yamago combine his own method (over platinumcomplex) and Jasti/Bertozzi method (reductive aromatization as last step)

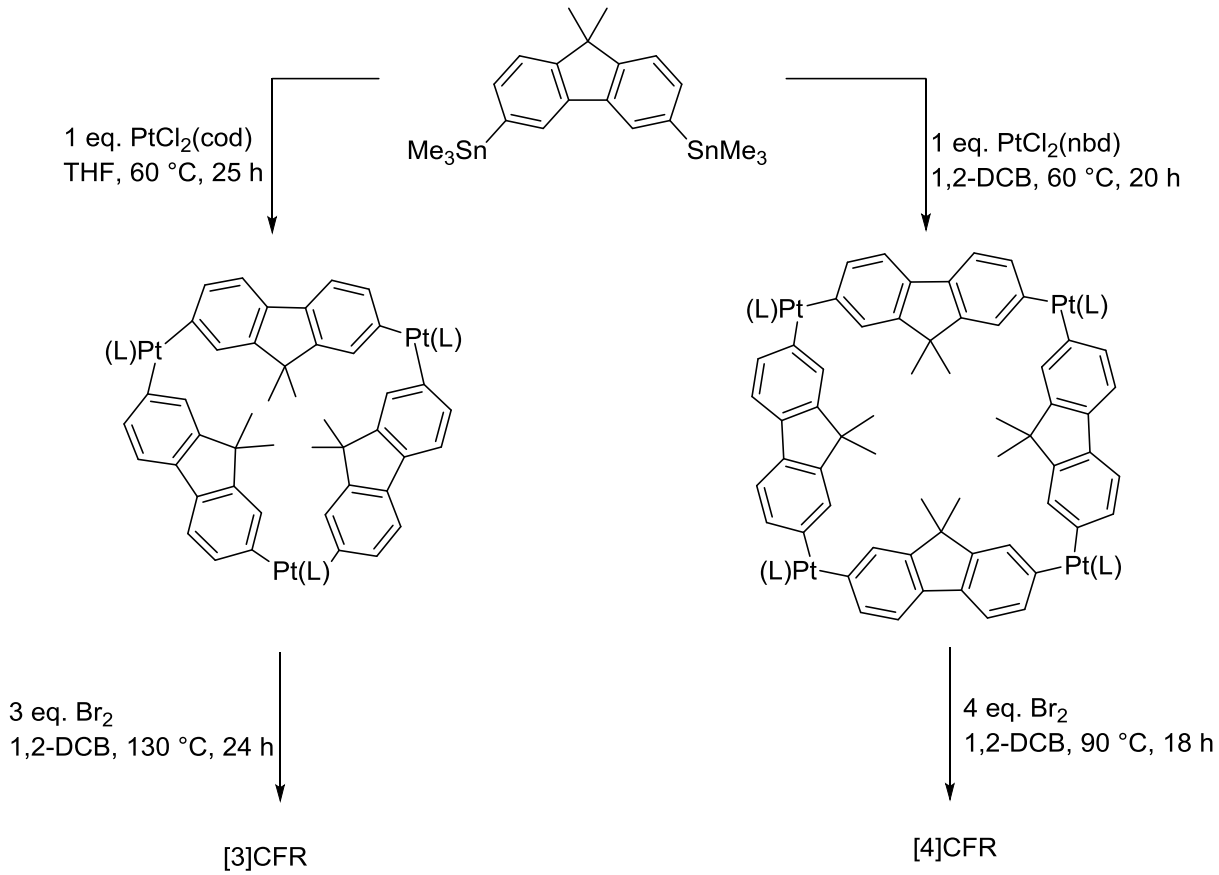


R = $SiEt_3$, X = Br

R = $SiEt_3$, M = Pt or Ni

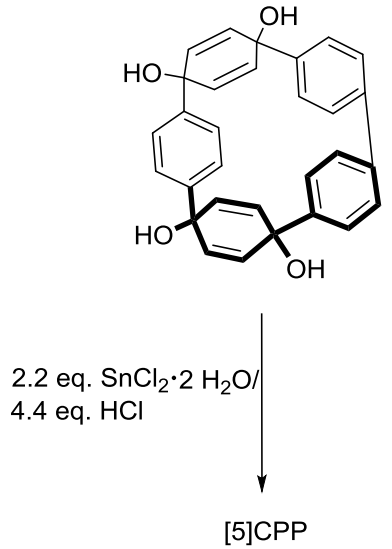
E. Kayahara, V. Patel, S. Yamago; *J. Am. Chem. Soc.* **2014**, *136*, 2284–2287.

[3-4]CFR Synthesis



E. Kayahara, R. Qu, M. Kojima, T. Iwamoto, T. Suzuki, S. Yamago; *Chem. Eur. J.* **2015**, *21*, 18939–18943.

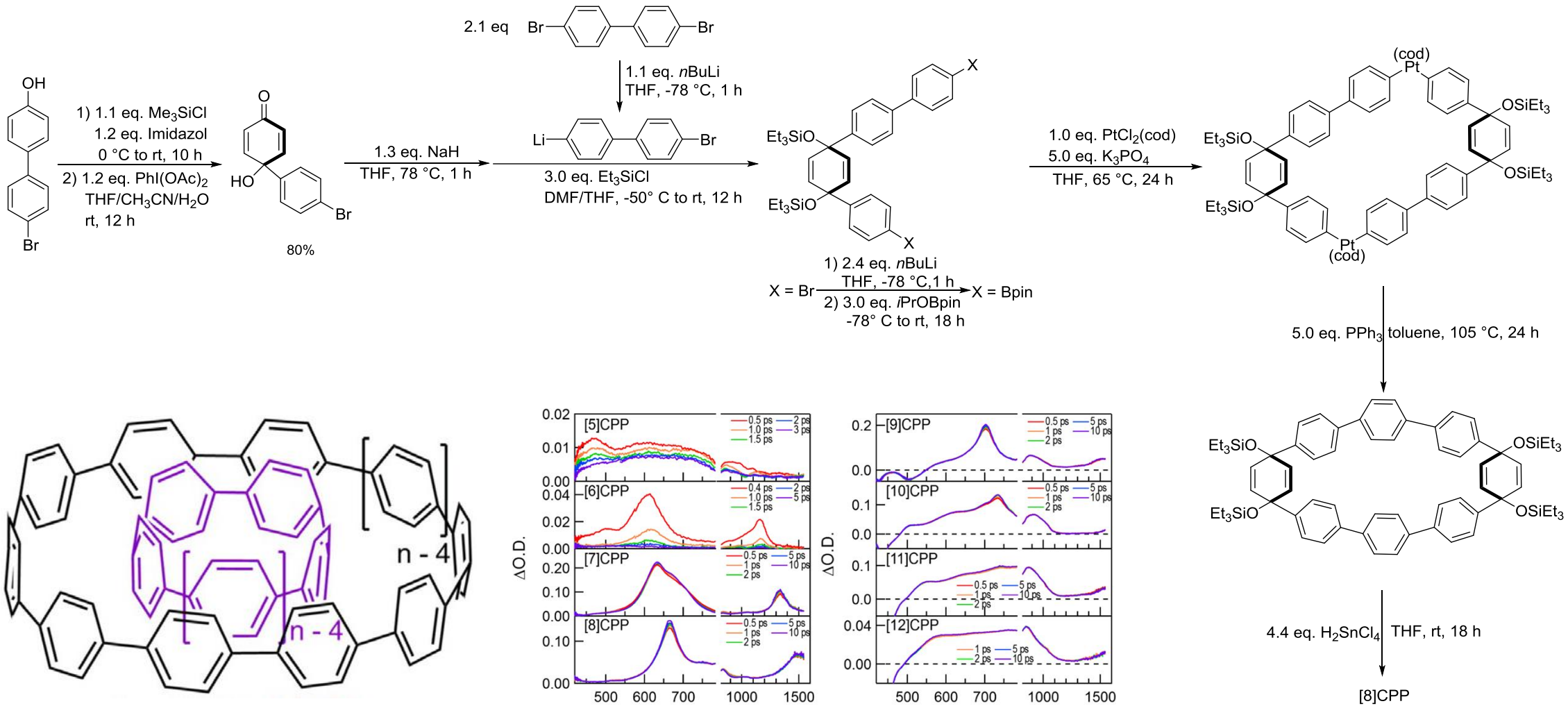
Rearomatization with H_2SnCl_4



- Easy way to rearomatize CPP precursors
- Standard method for rearomatization

V. Patel, E. Kayahara, S. Yamago; *Chem. Eur. J.* **2015**, *21*, 5742–5749.

Gram-Scale Synthesis of [8]CPP



S. Hashimoto, T. Iwamoto, D. Kurachi, E. Kayahara, S. Yamago; *ChemPlusChem* **2017**, *82*, 1015–1020.

M. Fujisuka, C. Lu, B. Zhuang, E. Kayahara, S. Yamago, T. Majima; *J. Phys. Chem.* **2019**, *123*, 4737–4742.

T. Kawanishi, K. Ishida, E. Kayahara, S. Yamago; *J. Org. Chem.* **2020**, *85*, 2082–2091.