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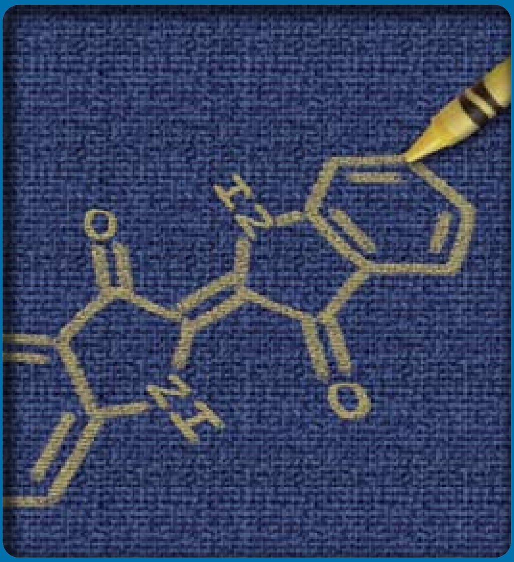


Colors and Chemical Names (2)

Kentaro Sato

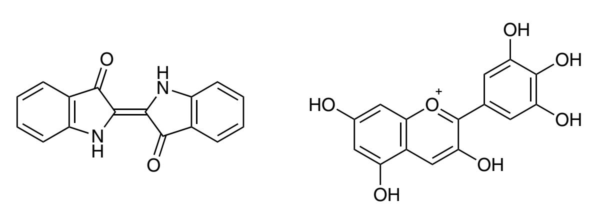
Continuing from the last article, let us keep going over more examples of elements and compounds named after their colors.

Blue

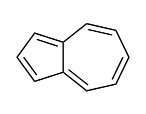
Two elements whose names are derived from the color of blue are indium (atomic number 49) and cesium (55). Indium was named after indigo based on the blue color of its emission spectrum, and cesium was named after the Latin *caesius*, which means sky blue, because it also showed blue emission spectrum.

Though blue is the color of ocean and sky, it is for some reason a rare color in the biological world. The rarity of blue is perhaps reflected in our traditional images such as bluebirds being a symbol of happiness and blue rose being a synonym of improbability. As for naturally occurring organic compounds having a bluish color, only a few are known. Indigo and delphinidin (the pigment of the Delphinium flowers) are well-known examples but there aren't too many others.

A famous hydrocarbon compound appearing blue is azulene, which is composed of fused five- and seven-membered aromatic rings and is an isomer of naphthalene. *Azul* means blue and is a part of such words as *Côte d'Azur* (the French Riviera) and the *Azzurri*, the nickname of Italian national football team.

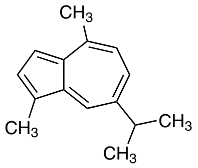


Indigo and delphinidin



Azulene

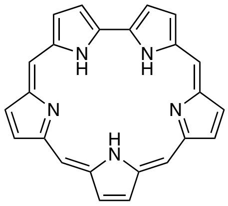
There are natural products possessing an azulene skeleton. For example, the unforgettably bright blue color of the mushroom species known as *rurihatsutake* or blue milk mushroom originates from azulene derivatives. Also, some essential flower oils turn bluish under high thermal conditions during distillation. This phenomenon is the result of dehydration and oxidation of certain terpenoids containing fused five- and seven-membered rings, producing aromatic compounds of the likes of guaiazulene. These compounds are known for their anti-inflammatory effects and are used as medicines even today. If you see any stomach medicines or mouthwash liquids colored blue, those products very likely contain an azulene derivative.



Guaiazulene

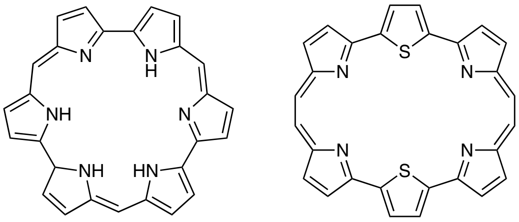
As for blue-colored minerals, sapphire would probably come to your mind first. Chemically speaking, sapphire is a crystal of aluminum oxide containing varied amounts of iron and titanium impurities. The name is derived from the Latin *sapphirus* or the Greek *sappheiros*, both of which correspond to blue.

The total synthesis of vitamin B_{12} led by the late R. B. Woodward was a monumental achievement in the history of organic synthesis that resulted in the development of various spin-off chemistries. One of the compounds synthesized as byproduct was the macrocyclic compound composed of five pyrrole units. This compound was named sapphyrin after its bright blue color and the same suffix to porphyrin. The synthesis of sapphyrin sparked the following development of macrocyclic porphyrinoid chemistry.



Sapphyrin

Many porphyrinoids were synthesized afterwards and were named after jewels, including rubyrin, which was introduced in the previous article. Besides rubyrin, there have been made assortment of jewels of organic synthesis such as green-colored smaragdyrin (named after the Latin *smaragdus* meaning emerald) and ozaphyrin (based on the Emerald City from the Wizard of Oz), rose red-colored rosarin, orange-colored orangarin, turquoise-colored turcasarin, purple-colored amethyrin (named after amethyst), and bronze-colored bronzaphyrin.



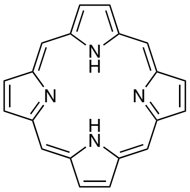
Rosarin and bronzaphyrin

Purple

Japan is a nation of scarce natural resources, but did you know that it is the largest producer of one particular element? It is iodine, which Japan actually produces a third of the total amount produced in the world. Most of the Japanese iodine are mined from the natural gas deposit in Kujukurihama in Chiba prefecture.

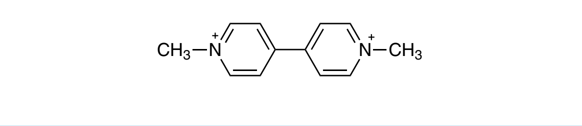
Iodine was first isolated in 1813 from the vapor produced by the acidic treatment of seaweed ash. The vapor had purple color, so the element was given the name after the Greek *ioeides*, which means violet. The Japanese name *youso* is a transliteration of iodine.

As mentioned so far, a wide variety of porphyrin derivatives have been synthesized that show beautiful colors. The original porphyrin itself is colored purple so dark that even a highly dilute solution of it is brightly colored. Accordingly, its name is derived from *porphyra*, the Greek term meaning purple.



Porphyrin

There is an organic compound called viologen whose name is derived from violet. The structure of viologen contains two *N*-methylpyridinium cations bonded at the 4 position of each other. The fact that it turns bright violet when it is reduced to form a radical cation led to its name. Upon reoxidation, the radical cation produces reactive peroxides that are known to damage nearby compounds. Viologen and related compounds are used as pesticides (paraquat) for this property, but since it is also toxic to animals its use is banned or strictly restricted in some countries.

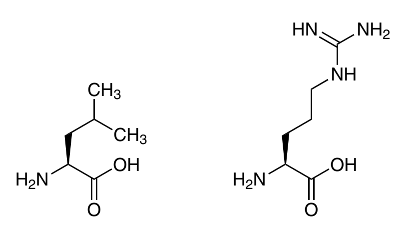


Viologen

White

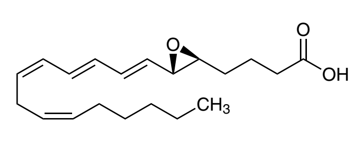
Even though most organic compounds appear either white or colorless, some are known that have a name derived from the color of white. *Albus*, the Latin translation of white, is found in words such as album (which originally meant white message board). Egg white was similarly called *albumen* and the proteins it contained were named albumins.

In a similar manner, one of the amino acids leucine was named after the Greek *leukos* that means white because it was first obtained as white crystals. Another amino acid arginine has similar naming background, as it was named after the Greek *argyros*, meaning silver, because it was first isolated in silvery crystalline form. It is also the origin of the atomic symbol of silver, Ag.



Leucine and arginine

The Greek *leukos* also became the origin of the name of white blood cells (leukocytes). Branching out from there, names like leukotrienes and interleukins were assigned to relevant important biological substances. There are apparently many other examples containing the prefix *leuko* in the field of biology.



Leukotriene A4

Other colors

Some substances are named after them having a wide color variation instead of one specific color. For example, the name of iridium is based on Iris, the Greek goddess of the rainbow, since the salts of iridium complexes came in a variety of colors which reminded of a rainbow.

Chromium was named in similar fashion after the Greek *chroma*, meaning color, because again its salts showed diverse colors. There are a number of words containing *chroma*, including chromatography, chromism (the reversible change of color in response to externally applied stimulus), and chromosome.

We have gone over elements and compounds named after their colors. There should be certainly more examples that escaped my literature search but it only proves the close relationship and the long history between color and chemistry. Researches closely related to colors such as organic light-emitting diodes, chromisms, and phosphorescent reagents are now expanding their realms, therefore we can expect more of the compounds named after colors to come out in the future. Naming a new, hard-obtained compound is one of the biggest rewards for chemists. If you ever get a chance to be a godfather of a new compound, these old examples may be helpful as good references.

Introduction of the author :

Kentaro Sato

[Brief career history] He was born in Ibaraki, Japan, in 1970. 1995 M. Sc. Graduate School of Science and Engineering, Tokyo Institute of Technology. 1995-2007 Researcher in a pharmaceutical company. 2008-Present Freelance science writer. 2009-2012 Project assistant professor of the graduate school of Science, the University of Tokyo.
[Specialty] Organic chemistry
[Website] The Museum of Organic Chemistry <http://www.org-chem.org/yuuki/MOC.html>

Visit to a Science Club

Chemistry Club at Komaba Toho Junior and Senior High School

Introduction

The TCIMAIL covers activities of science clubs by junior and senior high school students who make great efforts here in Japan and abroad. This third report will feature the chemistry club in Komaba Toho Junior and Senior High School, which has received the grand award and best poster award in the Chemistry Club Presentation hosted by the Chemical Society of Japan, Kanto Branch in March 2013.

Based upon the basic educational policy “Think for yourself to find an answer”, the school implements science education placing importance on experiments and observations such as a weekly small-group experiment by dividing a class in half. We visited the chemistry club during the school festival on September 14, and the club meeting on October 21, 2013, when its new organizational framework was just launched after the festival centering on the 10th grade members. During an experiment, students always wore a white laboratory coat and safety eye glasses properly. It seemed that the school was really committed to educating safety control measures.

Members of the chemistry club in Komaba Toho Junior and Senior High School
(TCI reagents are thankfully used)

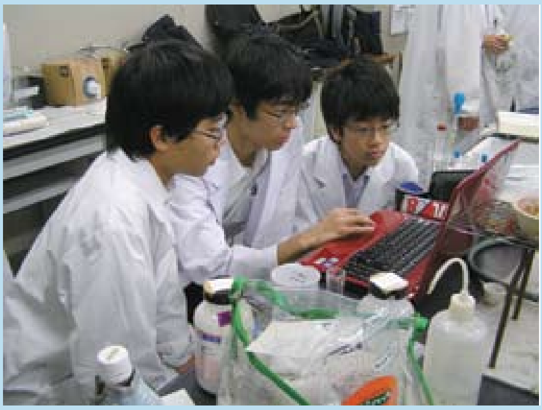
Chemistry Club in Komaba Toho Junior and Senior High School

The chemistry club was established in 1957, the same year as the school’s foundation. This traditional club appointed a new captain as the 56th. As of 2013, 58 students (32 junior high and 26 senior high from 10th to 11th grade) participate in the club under the guidance of teachers, Mr. Matsuoka, Mr. Hitora and Mr. Yanagisawa. They meet three times a week and conduct a theme-based experiment and research per team with several peers. While the members worked on experiments earnestly, it was impressive that they had a sense of humor such as their unique team names of “Genghis Khan” and “Kublai Khan” (the sound “Khan” means a team in Japanese), which were passed down for generations. At the beginning of every school year, each team leader sets a broad goal for experiments and teaches under-grade members to work together with them. They set up an opportunity at the end of a semester to report on their experimental results within the club, and lay out a new goal for the next semester. New and prospective 7th grade members of the club are required to attend basic chemistry lessons and experiment workshops from the sign-up in April until their assignment to a team in September. Studying the basics of chemistry and experiments for half a year, they may stand at the starting line as a researcher for the first time and are treated as members of the teams.

Study results from their successive accumulation of experiments are presented at the Japan Student Science Award (Tokyo round in September and the final in November), the Chemistry Club Presentation hosted by the Chemical Society of Japan, Kanto Branch (in March), and the Science Research Presentation hosted by Chiba University (in September). These competitions are not just a place to make a research presentation but also to communicate and interact with students from other schools.

Extracurricular activities during the summer vacation are also essential parts. In August, the members learn social ties with chemistry through the lodging camp and factory tours. To prepare for the school festival, they keep working energetically during the summer vacation. It seemed that their hard work led to a great turnout of people during the school festival in September, including adults who came to see their demonstration experiments.

As mentioned earlier, the chemistry club places great importance on safety management education. All members always report in writing on the amount and duration of use of reagents, and details and impressions of activities. Supervising their activities at all times and conducting regular discussions and safety guidance, the advisory teachers support the safety and improvement of experimental techniques and knowledge among the students.



One moment of the club activity
(Students are having a discussion in front of a laptop.)

Award winning study results in 2013

Chemistry Club Presentation (by the Chemical Society of Japan, Kanto Branch) - Grand award
Japan Student Science Award – Tokyo round (High school category) Grand award, entered the final
(Liesegang phenomenon research team): The study on the Liesegang phenomenon with lead

The Liesegang phenomenon is a process of periodical precipitation from reacting a substance in a gel in contact with another substance. This study examines the connection between concentration and the pattern of the liesegang phenomenon, performing experiments with lead iodide (II) and lead chloride (II) solutions. The same observation is conducted on a solution with two types of anions. As a result, it has been identified that, as for a mixed-type liesegang ring, a pattern of lead chloride (II) is formed first, followed by a pattern of lead iodide (II) which grows downwards little by little. It also reports that the precipitation of lead chloride (II) is displaced by lead iodide (II) which has a smaller solubility product, and a characteristic needle crystal of lead iodide (II) is developed from the surface.

Chemistry Club Presentation website
Relevant article (Japanese): http://www.chemistry.or.jp/news/information/-3032661949383674-7.html
Presentation paper (Japanese): http://kanto.csj.jp/?action=common_download_main&upload_id=244f#page=14

Chemistry Club Presentation by the Chemical Society of Japan, Kanto Branch - Best poster award
Japan Student Science Award - Tokyo round (High school category) Award for effort
(Metal team): The study of the Traube's artificial cell

$[Fe(CN)_6]^{3-}$ and $[Fe(CN)_6]^{4-}$ form a colored precipitation by reaction with a transition metal ion. The phenomenon "Traube's artificial cell" is an example of this reaction using aqueous solution and a crystal. This study observes a formation of artificial cells and researches details of the mechanism associating with a similar phenomenon "Chemical garden". It has revealed that the direction of growth and elaboration of the precipitation membrane depend on the concentration of aqueous solution.

Chemistry Club Presentation website
Presentation paper (Japanese): http://kanto.csj.jp/?action=common_download_main&upload_id=244f#page=63

Japan Student Science Award (High School category) - Incentive award
(Resin team): The study of coloring and decoloring of carbonless paper

Crystal violet (CV) is a dye used as an ink for carbonless paper as well as a pH indicator and cell stain solution. This study team has made a paper that is colored by keeping CV in microcapsules and applying friction. They are looking into dispersing these capsules into agar in which the color will change by friction.
TCI's CV is thankfully used. (TCI Product Number C0428)

Science Research Presentation by Chiba University - Poster presentation
(Crystal team): The study of a chemical garden with two types of salts

Award winning results in 2013

High School Chemistry Grand Prix 2013 - Silver award (Tomoki Yamanishi, 12th grade), Commendation from the manager of Kanto branch (Hiroyuki Mizuno, 11th grade)
Junior High School Tokyo Science Competition - Silver award (8th grade team), Bronze award (7th grade team)

Magazine article

The Chemical Society of Japan, "*Kagaku-to Kyoiku (Chemistry and Education)*" **2013**, *61*(7), 352.
Komaba Toho Junior and Senior High School Chemistry Club: Exploration of the Liesegang phenomenon

New captain and teachers' voice

The new captain Mr. Ishikawa and sub-captain Mr. Ono (both 10th grade) talked about reasons for applying for the club when they became interested in chemical experiments after seeing one in the club orientation session. They also heard about the above-mentioned tutoring system to lower-grade members per team. Teachers said that they were feeling sorry for some teams which were obliged to refrain from participating in presentations and competitions as the result of in-club selection due to the limited number of applicants, which would be a concern peculiar to a large organization.

The chemistry club motto was put above the lab entrance.

Closing Remarks

We would like to end up with the chemistry club motto, "Safety first. Protective eye glasses required. A new discovery leads to a door to the future", which was placed above the laboratory entrance in a frame. We wish for continued success and future growth of the chemistry club in Toho Komaba Junior and Senior High School. The TCIMAIL will continue the feature articles of science laboratories in junior and senior high school to meet new people and to make new discoveries.

Technical Glossary

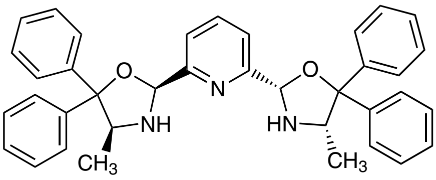
Liesegang phenomenon (Liesegang rings): To an electrolyte gel, another reactive electrolyte solution is poured on the top of the gel to form periodic bands of precipitation. The process is known as the Liesegang phenomenon, which was discovered by a German colloid chemist, R. E. Liesegang (1869-1947) in 1896. The phenomenon is easily shown in natural artistic structures like in agate formed as a result of crystallization from hydrothermal fluids. The Liesegang bands would be formed by diffusion, but the phenomenon does not have any explanation.

Traube's artificial cell: M. Traube (1829-94) is known as the inventor of Traube's stalagmometer for the determination of the surface tension of liquids. In 1864, Traube dropped crystals of potassium ferrocyanide into a solution of copper sulfate. Then, the crystals were instantly coated with precipitated membrane and grow out like real living cells, which were named as artificial cells by him. Is this an "artificial cell"? Of course not, if we think of it as a model of a living cell. The phenomenon is a reaction between potassium ferrocyanide and copper sulfate to form copper ferrocyanide as a semipermeable membrane (chemical equation: $2CuSO_4 + K_4Fe(CN)_6 \rightarrow 2K_2SO_4 + Cu_2Fe(CN)_6$). The membrane enables the selective movement of water molecules by osmosis from the more dilute potassium ferrocyanide solution. The attraction of water into the "cell" across the membrane gives rise to an increase in the volume of the cell.

Chemical garden: Chemical garden is an chemical experiment performed by adding metal salts such as copper sulfate or cobalt(II) chloride to an aqueous solution of sodium silicate, known as waterglass. This results in growth of plant like forms in minutes to hours. The chemical garden was first observed by an alchemist, J. R. Glauber in 1646.

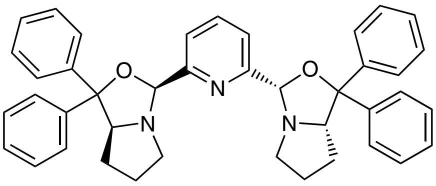
Efficient Bis(oxazolidine)pyridine Ligands Utilized for the Asymmetric [3+2] Cycloaddition

B4227	**2,6-Bis[(2*S*,4*S*)-4-methyl-5,5-diphenyloxazolidin-2-yl]pyridine (1)**	**50mg**
B4228	**2,6-Bis[(2*S*,5*S*)-4,4-diphenyl-1-aza-3-oxabicyclo[3.3.0]octan-2-yl]pyridine (2)**	**50mg**



1

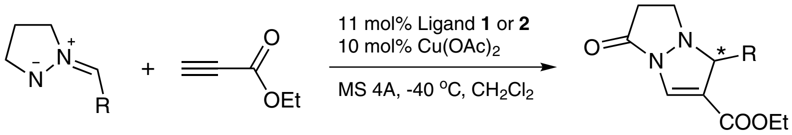
[PyBodine(Ala)]



2

[PyBodine(Pro)]

Bis(oxazolidine)pyridine (=PyBodine) ligands are tridentate ligands developed by Arai *et al*. PyBodine ligands **1** and **2** are easily prepared from optically active hydroxyamines derived from the related amino acids allowing the design of various chiral asymmetrical fields by replacing optically active hydroxyamines. The reactivity and enantioselectivity of various PyBodine ligands are evaluated by using a high-throughput screening system for analyzing the asymmetric induction with circular dichroism as a detector. As a result, in the presence of copper(II) acetate, the ligands **1** and **2** derived from L-alanine and L-proline respectively, show high reactivities for the catalytic asymmetric [3+2] cycloaddition of azomethine imines with propiolates. In this reaction, when using **1** as a ligand, (*R*)-adducts of *N*,*N*-bicyclic pyrazolidinone derivatives are given with excellent enantioselectively. Whereas, (*S*)-adducts are enantioselectively formed by using the ligand **2**. Thus, the ligands **1** and **2** can be complementarily used for the enantioselective synthesis of *R*/*S*-isomers.



Ligand **1** or **2**	R	Time (h)	Yield (%)	ee (%)
1	Ph	28	99	94 (*R*)
2	Ph	47	88[a]	76 (*S*)
1	*p*-Me-C_6H_4	19	81	90 (*R*)
1	*p*-F-C_6H_4	19	77	89 (*R*)
1	*c*-C_6H_{11}	27	99	88 (*R*)

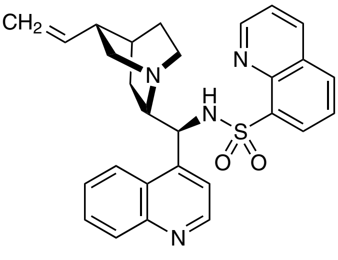
a) The reaction was carried out without MS 4A.

Reference

Development of a tailor-made bis(oxazolidine)pyridine–metal catalyst for the [3+2] cycloaddition of azomethine imines with propiolates
T. Arai, Y. Ogino, T. Sato, *Chem. Commun.* **2013**, *49*, 7776.

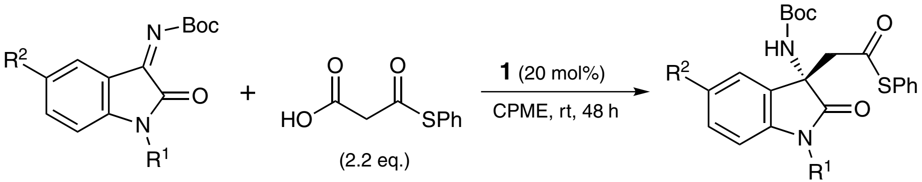
Heteroarenesulfonyl Cinchona Alkaloid Amine Catalyst

C2728 *N*-[(9*S*)-8α-Cinchonan-9-yl]quinoline-8-sulfonamide (**1**) 100mg



1

Nakamura *et al*. have reported development of the heteroarenesulfonyl cinchona alkaloid amine catalyst, *N*-[(9*S*)-8α-cinchonan-9-yl]quinoline-8-sulfonamide (**1**), and its use for the enantioselective decarboxylative Mannich reaction of ketimines. According to their results, the reaction of ketimines with malonic acid half thioesters in the presence of **1** affords the corresponding β-aminocarbonyl compounds with high enantioselectivity. Since β-aminocarbonyl compounds are important backbones of pharmaceuticals and agricultural chemicals, they can be converted into biologically active substances, such as optically active AG-041R.



CPME: cyclopentyl methyl ether

Entry	R^1	R^2	Yield (%)	ee (%)
1	Me	H	91	83 (*S*)
2	$CH_2{=}CHCH_2$	H	92	81 (*S*)
3	$(EtO)_2CHCH_2$	H	71	80 (*S*)
4	Me	Me	80	80 (*S*)

Typical Procedure (Entry 1):
To a solution of ketimine (0.038 mmol, 10.0 mg) and **1** (0.008 mmol, 3.9 mg) in CPME (0.5 mL), malonic acid half thioester (0.084 mmol, 16.4 mg) is added and stirred for 48 h. After removal of a solvent, the residue is purified by silica gel column chromatography (hexane:AcOEt = 80:20) to afford the (*S*)-product (14.3 mg, Y. 91%) as a white solid.

References

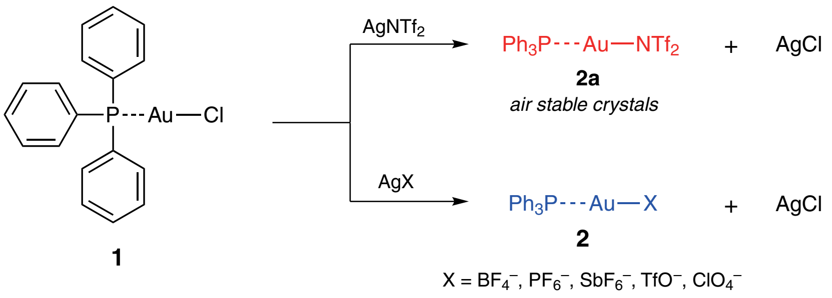
1) Heteroarenesulfonyl cinchona alkaloid amine catalyst and method for the preparation of β-aminocarbonyl compound thereby
S. Nakamura, N. Shibata, N. Hara, Nagoya Institute of Technology, Jpn. Kokai Tokkyo Koho 2013 112673, **2013**.
2) Enantioselective synthesis of AG-041R by using *N*-heteroarenesulfonyl cinchona alkaloid amides as organocatalysts
N. Hara, S. Nakamura, M. Sano, R. Tamura, Y. Funahashi, N. Shibata, *Chem. Eur. J.* **2012**, *18*, 9276.

A Convenient Gold(I) Complex Used for the Preparation of Cationic Gold(I) Complexes

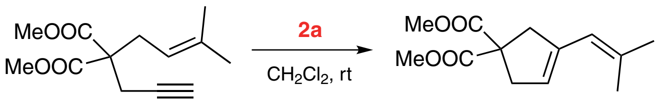
T2994 (Triphenylphosphine)gold(I) Chloride (1) 200mg, 1g

(Triphenylphosphine)gold(I) chloride (**1**) is an air stable monovalent gold complex and it affords active cationic gold(I) complexes (**2**) by the treatment with some silver salts. Recently, hydroaminations to unsaturated bonds and cycloisomerizations of enynes using **2** as an active species have been reported, and it is showed that the reactivity of **2** is often different based on the different silver salts used in the preparation of **2**. Cationic gold(I) complexes (**2**) prepared from $AgBF_4$ or $AgSbF_6$ salts are generally unstable due to the fluorine-based counterion. Therefore, they are promptly used after in situ preparation. On the other hand, cationic gold(I) complex (**2a**) prepared from $AgNTf_2$ salt is quite stable and the related crystals can be isolated. The complex **2a** is soluble in most commonly used solvents and shows high reactivity. In addition, **2a** catalyzed cycloisomerizations of enynes proceed successfully even when small amounts of catalyst (0.1 mol%) are used. Now, cationic gold(I) catalysts-promoted novel organosynthetic reactions have been studied and developed. Thus, **1** is a convenient precatalyst available for the preparation of various cationic gold(I) complexes.

General Preparation of Active Gold(I) Species **2**

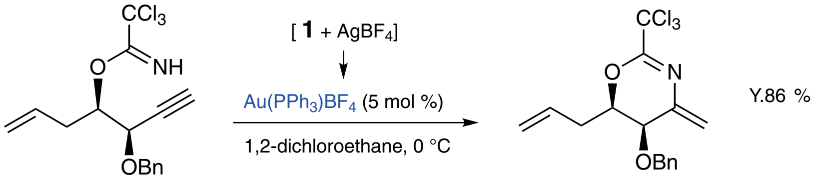


Cycloisomerization of Enyne



2a (mol %)	Time (min)	Yield (%)
1	5	97
0.1	5	96
0.01	30	97

Intramolecular Hydroamination



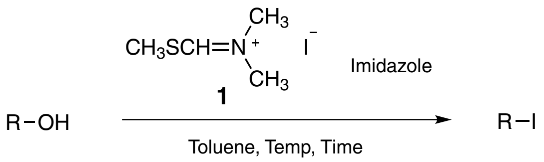
References

1) Phosphine gold(I) bis-(trifluoromethanesulfonyl)imidate complexes as new highly efficient and air-stable catalysts for the cycloisomerization of enynes
N. Mézailles, L. Ricard, F. Gagosz, *Org. Lett.* **2005**, *7*, 4133.
2) Gold(I)-catalyzed intramolecular hydroamination of alkyne with trichloroacetimidates
J.-E. Kang, H.-B. Kim, J.-W. Lee, S. Shin, *Org. Lett.* **2006**, *8*, 3537.
3) Catalytic carbophilic activation: Catalysis by platinum and gold π acids
A. Fürstner, P. W. Davies, *Angew. Chem. Int. Ed.* **2007**, *46*, 3410.

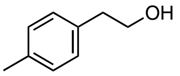
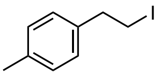
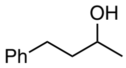
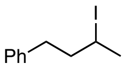
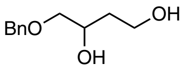
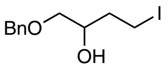
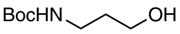
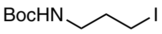
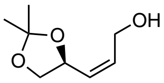
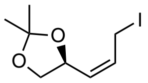
A Convenient Nucleophilic Iodinating Reagent

D4340 *N*,*N*-Dimethyl-*N*-(methylsulfanylmethylene)ammonium Iodide (1) 5g, 25g

N,*N*-Dimethyl-*N*-(methylsulfanylmethylene)ammonium iodide (**1**) developed by Porter *et al*. is a novel nucleophilic iodinating reagent. It can convert primary and secondary alcohols to the corresponding iodo compounds. Though it is generally difficult to accomplish the iodination of allylic alcohols, **1** can replace them with the desired allyl iodides. In addition, primary alcohols react more rapidly than secondary alcohols, which allows selective iodination of primary hydroxy groups in primary-secondary diols. The similar iodinations using triphenylphosphine/iodinating reagents generate stoichiometric amounts of triphenylphosphine oxide, which often causes difficulty in product purification. In contrast, iodination using **1** has advantages such as easy work-up and product purification. Thus, **1** can be used as a convenient nucleophilic iodinating reagent.



R-OH = primary alcohol, secondary alcohol

Alcohol	Temp (°C)	Time (min)	Product	Yield (%)
	85	90		92
	85	120		86
	85	60		82
	85	120		82
	55	150		71

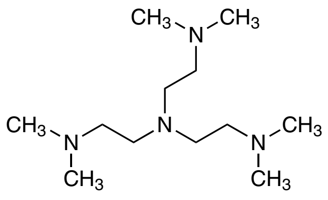
Typical Procedure: Iodination of 2-(4-methylphenyl)ethanol
A solution of 2-(4-methylphenyl)ethanol (102 mg, 0.75 mmol) in toluene (3.5 mL) is heated to 85 °C. **1** (260 mg, 1.12 mmol) and imidazole (25 mg, 0.37 mmol) are added and the mixture is stirred at 85 °C for 90 min. After cooling to room temperature, the reaction mixture is concentrated *in vacuo* to afford the crude product. Purification by flash chromatography (SiO_2; petrol) affords 1-iodo-2-(4-methylphenyl)ethane as a colorless oil (170 mg, Y. 92%).

Reference

Selective conversion of alcohols into alkyl iodides using a thioiminium salt
A. R. Ellwood, M. J. Porter, *J. Org. Chem.* **2009**, *74*, 7982.

Multidentate Ligand for Atom Transfer Radical Polymerization

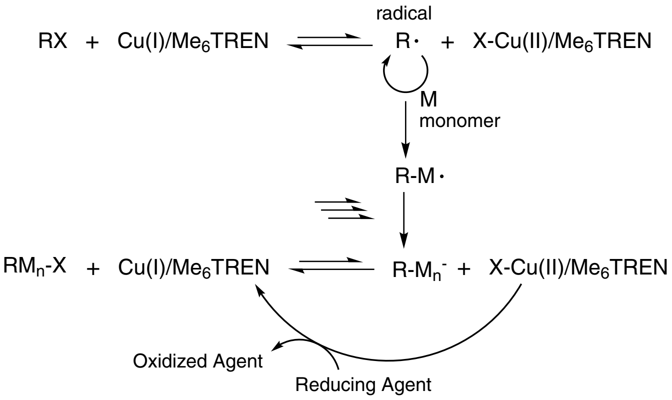
T2898 Tris[2-(dimethylamino)ethyl]amine (1) 1g, 5g



Me_6TREN (**1**)

Tris[2-(dimethylamino)ethyl]amine (Me_6TREN, **1**) is an efficient multidentate ligand for atom transfer radical polymerization (ATRP). ATRP is the metal catalyzed polymerization which enables exact control for preparation of polymers with predetermined molecular weights and narrow molecular weight distributions. A Cu(I) complex coordinated with **1** is the active species and transforms alkyl halides into a radical species by a one-electron reduction and the radical species acts to polymerize with monomers. Also, a Cu(II) complex coordinated with **1**, generated by one electron oxidation, transforms the polymer growth terminal into a dormant species by a one-electron reduction-promoted halogen atom transfer. ATRP is completed by repeating a series of reactions.

In this ATRP, it is enough for the polymerization to proceed with only a few ppm of Cu(I) complex (*ca.* 1/1000 – 1/10000 amounts of typical ATRP). So it is expected that ATRP using **1** can be applied to not only research, but also to industry.

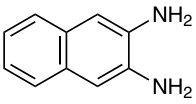


References

1) Activators regenerated by electron transfer for atom transfer radical polymerization of styrene
W. Jakubowski, K. Min, K. Matyjaszewski, *Macromolecules* **2006**, *39*, 39.
2) Synthesis of high molecular weight poly(styrene-*co*-acrylonitrile) copolymers with controlled architecture
J. Pietrasilk, H. Dong, K. Matyjaszewski, *Macromolecules* **2006**, *39*, 6384.
3) Use of ascorbic acid as reducing agent for synthesis of well-defined polymers by ARGET ATRP
K. Min, H. Gao, K. Matyjaszewski, *Macromolecules* **2007**, *40*, 1789.
4) Diminishing catalyst concentration in atom transfer radical polymerization with reducing agents
K. Matyjaszewski, W. Jakubowski, K. Min, W. Tang, J. Huang, W. A. Braunecker, N. V. Tsarevsky, *Proc. Natl. Acad. Sci. U.S.A.* **2006**, *103*, 15309.

NO Detection Reagent

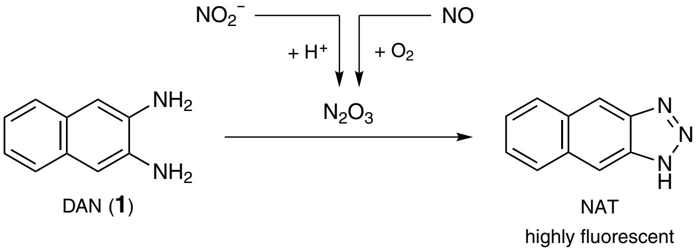
D4101 2,3-Diaminonaphthalene (=DAN) (1) 100mg



1

Nitric oxide (NO) is generated in the pathway converting L-arginine to L-citrulline *via* nitric oxide synthase (NOS). NO plays a biologically important role and has been demonstrated to be a mediator in cardiac and vascular diseases, inflammatory diseases, diabetes, cancer *etc.*1)

NO is oxidized to nitrite (NO_2^-) by molecular oxygen. Acidification of NO_2^- or interaction of NO with oxygen generates dinitrogen trioxide (N_2O_3). N_2O_3 reacts with 2,3-diaminonaphthalene (DAN, **1**) to yield 2,3-naphthotriazole (NAT).2) As NAT is highly fluorescent, **1** is applied to fluorometric detection of NO and numerous improved protocols have been reported.3-5) (Example of detection condition4)): Ex. 365 nm, Em. 450 nm).



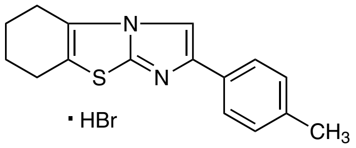
Detection of NO or NO_2^- with **1**2)

References

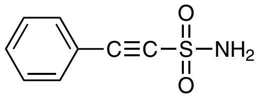
1) Nitric oxide and peroxynitrite in health and disease
P. Pacher, J. S. Beckman, L. Liaudet, *Physiol. Rev.* **2007**, *87*, 315.
2) Methods to detect nitric oxide and its metabolites in biological samples
N. S. Bryan, M. B. Grisham, *Free Radic. Biol. Med.* **2007**, *43*, 645.
3) Improved nitric oxide detection using 2,3-diaminonaphthalene and its application to the evaluation of novel nitric oxide synthase inhibitors
N. Nakatsubo, H. Kojima, K. Sakurai, K. Kikuchi, H. Nagoshi, Y. Hirata, T. Akaike, H. Maeda, Y. Urano, T. Higuchi, T. Nagano, *Biol. Pharm. Bull.* **1998**, *21*, 1247.
4) Fluorimetric nitrite analysis using 2,3-diaminonaphthalene: an improvement of the method
M.-C. Carré, B. Mahieuxe, J.-C. André, M.-L. Viriot, *Analusis* **1999**, *27*, 835.
5) Use of colorimetric test strips for monitoring the effect of hemodialysis on salivary nitrite and uric acid in patients with end-stage renal disease: a proof of principle
T. M. Blicharz, D. M. Rissin, M. Bowden, R. B. Hayman, C. DiCesare, J. S. Bhatia, N. Grand-Pierre, W. L. Siqueira, E. J. Helmerhorst, J. Loscalzo, F. G. Oppenheim, D. R. Walt, *Clin. Chem.* **2008**, *54*, 1473.

p53 Inhibitors

C2826 Cyclic Pifithrin-α Hydrobromide (1) **20mg, 100mg**
P2048 Pifithrin-μ (= 2-Phenylethynesulfonamide) (2) **10mg, 100mg**



1



2

p53 (Also known as Trp53 in mice, TP53 in humans) is a tumor suppressor protein that is frequently inactivated in tumors.[1] It has been revealed that inhibition of p53 can improve the reprogramming efficiency of human and mouse somatic cells.[2-7] The protein has been focused on in the research field.[8]

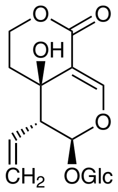
Pifithrins are inhibitors of p53. Pifithrin-α is a transcriptional inhibitor of p53 and rapidly converts to the condensation form, cyclic-pifithrin-α (**1**, also called pifithrin-β).[9] Pifithrin-μ (**2**) was initially identified as a small-molecule inhibitor of the binding of p53 to mitochondria by reducing its affinity to antiapoptic proteins Bcl-xL and Bcl-2.[10]

References

1) Assessing *TP53* status in human tumours to evaluate clinical outcome
T. Soussi, C. Béroud, *Nat. Rev. Cancer* **2001**, *1*, 233.
2) Two supporting factors greatly improve the efficiency of human iPSC generation
Y. Zhao, X. Yin, H. Qin, F. Zhu, H. Liu, W. Yang, Q. Zhang, C. Xiang, P. Hou, Z. Song, Y. Liu, J. Yong, P. Zhang, J. Cai, M. Liu, H. Li, Y. Li, X. Qu, K. Cui, W. Zhang, T. Xiang, Y. Wu, Y. Zhao, C. Liu, C. Yu, K. Yuan, J. Lou, M. Ding, H. Deng, *Cell Stem Cell* **2008**, *3*, 475.
3) Suppression of Induced pluripotent stem cell generation by the p53-p21 pathway
H. Hong, K. Takahashi, T. Ichisaka, T. Aoi, O. Kanagawa, M. Nakagawa, K. Okita, S. Yamanaka, *Nature* **2009**, *460*, 1132.
4) The *Ink4/Arf* locus is a barrier for iPS reprogramming
H. Li, M. Collado, A. Villasante, K. Strati, S. Ortega, M. Cañamero, M. A. Blasco, M. Serrano, *Nature* **2009**, *460*, 1136.
5) Linking the p53 tumour suppressor pathway to somatic cell reprogramming
T. Kawamura, J. Suzuki, Y. V. Wang, S. Menendez, L. B. Morera, A. Raya, G. M. Wahl, J. C. I. Belmonte, *Nature* **2009**, *460*, 1140.
6) Immortalization eliminates a roadblock during cellular reprogramming into iPS cells
J. Utikal, J. M. Polo, M. Stadtfeld, N. Maherali, W. Kulalert, R. M. Walsh, A. Khalil, J. G. Rheinwald, K. Hochedlinger, *Nature* **2009**, *460*, 1145.
7) A p53-mediated DNA damage response limits reprogramming to ensure iPS cell genomic integrity
R. M. Marión, K. Strati, H. Li, M. Murga, R. Blanco, S. Ortega, O. Fernandez-Capetillo, M. Serrano, M. A. Blasco, *Nature* **2009**, *460*, 1149.
8) p53, stem cells, and reprogramming: tumor suppression beyond guarding the genome
B. T. Spike, G. M. Wahl, *Genes & Cancer* **2011**, *2*, 404.
9) A chemical inhibitor of p53 that protects mice from the side effects of cancer therapy
P. G. Komarov, E. A. Komarova, R. V. Kondratov, K. Christov-Tselkov, J. S. Coon, M. V. Chernov, A. V. Gudkov, *Science* **1999**, *285*, 1733.
10) Small-molecule inhibitor of p53 binding to mitochondria protects mice from gamma radiation
E. Strom, S. Sathe, P. G. Komarov, O. B. Chernova, I. Pavlovska, I. Shyshynova, D. A. Bosykh, L. G. Burdelya, R. M. Macklis, R. Skaliter, E. A. Komarova, A.V. Gudkov, *Nat. Chem. Biol.* **2006**, *2*, 474.

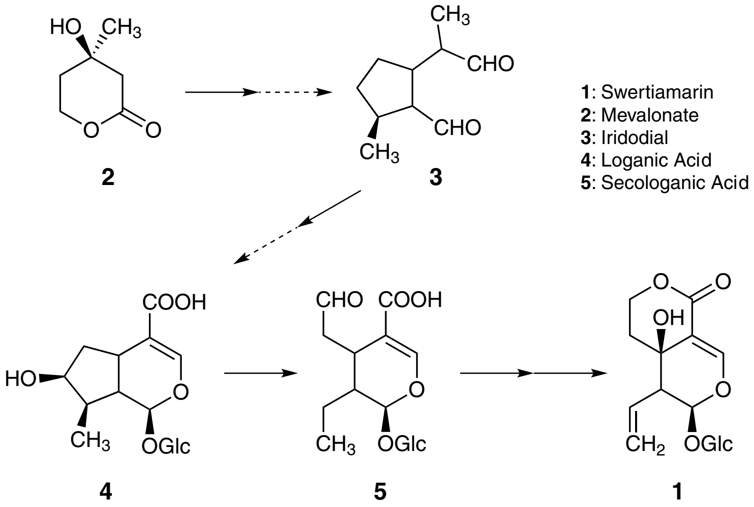
Plant Bitter Ingredient

S0897 Swertiamarin (1) 25mg



1

The bitter principles of genus *Swertia* can be classified into three groups: iridoid glycosides, secoiridoid glycosides, and biphenyl glycosides.1) Swertiamarin (**1**) is one of secoiridoid glucosides.1) The main biosynthetic pathway of **1** in the Gentianae is a route which leads from iridodial *via* deoxyloganic acid or loganic acid to secoiridoids.2) It has been numerously reported that **1** shows anti-inflammatory,3) anti-hyperlipidaemic,4) anti-nociceptive,4) hepatoprotective,4) anti-diabetic5,6) effects, *etc*.



Main biosynthetic pathway of Swertiamarin in the Gentianae2)

References

1) Systematic review on xanthones and others isolates from genus *Swertia*
A. Jamwal, *Int. J. Pharm. Chem. Sci.* **2012**, *1*, 1115.
2) Chemotaxonomy and pharmacology of Gentianaceae
S. R. Jensen, J. Schripsema, in *Gentianaceae: Systematics and Natural History*, eds. by L. Struwe, V. A. Albert, Cambridge University Press, Cambridge, **2002**, pp. 573-631.
3) Naturally occurring iridoids, secoiridoids and their bioactivity. An updated review, part 3
B. Dinda, D. R. Chowdhury, B. C. Mohanta, *Chem. Pharm. Bull.* **2009**, *57*, 765.
4) Naturally occurring iridoids, secoiridoids. An updated review, part 4
B. Dinda, S. Debnath, R. Banik, *Chem. Pharm. Bull.* **2011**, *59*, 803.
5) Decrease in serum matrix metalloproteinase-9 and matrix metalloproteinase-3 levels in Zucker fa/fa obese rats after treatment with swertiamarin
H. B. Vaidya, S. Giri, M. Jain, R. K. Goyal, *Exp. Clin. Cardiol.* **2012**, *17*, 12.
6) Glycogen phosphorylase-a is a common target for anti-diabetic effect of iridoid and secoiridoid glycosides
H. B. Vaidya, A. A. Ahmed, R. K. Goyal, S. K Cheema, *J. Pharm. Pharm. Sci.* **2013**, *16*, 530.

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