

## Publications 2004~2020

----- 2020 年 -----

實吉尚郎、小野晶

プロオリゴ型核酸医薬を志向した保護基の開発研究  
有機合成化学協会誌、**2020**, 78 (9), 886-893.(総説)  
<https://doi.org/10.5059/yukigoseikyokaishi.78.886>

Tatsuya Funai, Chizuko Tagawa, Osamu Nakagawa, Shun-ichi Wada, Akira Ono and Hidehito Urata

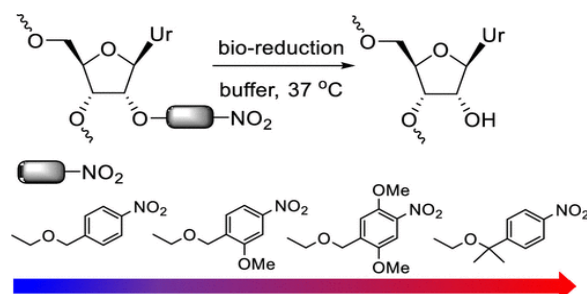
Enzymatic formation of consecutive thymine-Hg<sup>II</sup>-thymine base pairs by DNA polymerases  
*Chem. Commun.*, **2020**, 56, 12025-12028  
DOI: 10.1039/d0cc04423g  
<https://doi.org/10.1039/D0CC04423G>

Ryo Yamada, Issei Nomura, Yuki Yamaguchi, Yosuke Matsuda, Yoshikazu Hattori, Hirokazu Tada, Akira Ono, Yoshiyuki Tanaka

Electrical conductance measurement of Hg<sup>II</sup>-mediated DNA duplex in buffered aqueous solution  
*Nucleosides, Nucleotides, & Nucleic Acids*, **2020**, 39 (8), 1083-1087.  
<https://doi.org/10.1080/15257770.2020.1755044>  
(2020 Apr 28.)

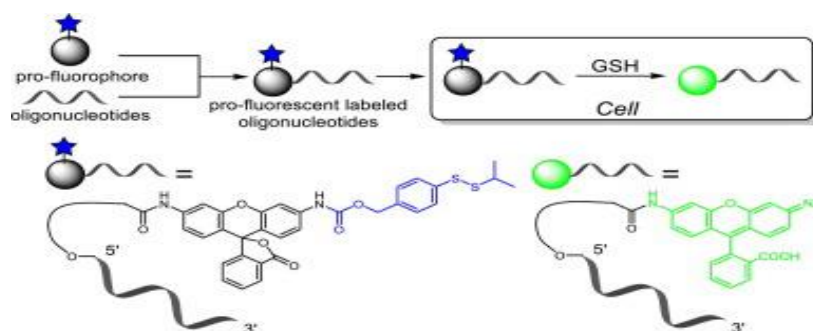
Hisao Saneyoshi, Kodai Nakamura, Kazuma Terasawa, Akira Ono

Development of Bioreduction Labile Protecting Groups for the 2'-Hydroxyl Group of RNA  
*Organic Letters*, **2020**, 22, 15, 6006-6009.  
<https://doi.org/10.1021/acs.orglett.0c02086>  
(Publication Date: July 14, 2020)



Hisao Saneyoshi, Yuta Yamamoto, Takayuki Ohta, Shoji Akai, Akira Ono

Thiol-responsive pro-fluorophore labeling: Synthesis of a pro-fluorescent labeled oligonucleotide for monitoring cellular uptake  
*Bioorganic & Medicinal Chemistry Letters*, **2020**, 30, 127222.  
<https://doi.org/10.1016/j.bmcl.2020.127222>  
(Volume 30, Issue 13, 1 July 2020, 127222)



Tatsuya Funai, Megumi Aotani, Risa Kiri, Junko Nakamura, Yuki Miyazaki, Dr. Osamu Nakagawa, Dr. Shun-ichi Wada, Prof. Dr. Hidetaka Torigoe, Prof. Dr. Akira Ono and Prof. Dr. Hidehito Urata

“Silver(I) ion-mediated cytosine-containing base pairs: Metal ion specificity for duplex stabilization and susceptibility toward DNA polymerases”

*ChemBioChem*, 2020, 21 (4), 517-522

<https://doi.org/10.1002/cbic.201900450> (First published: 28 August 2019)

----- 2019 年 -----

Very Important Paper に選ばれました。

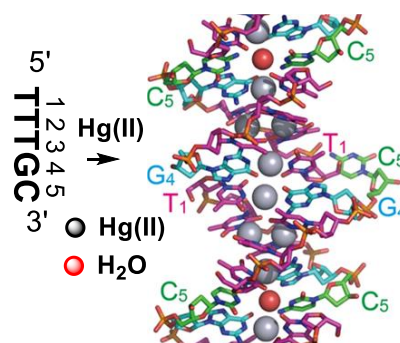
Akira Ono, Hiroki Kanazawa, Hikari Ito, Misato Goto, Koudai Nakamura, Hisao Saneyoshi, Jiro Kondo

“Novel DNA helical wire containing Hg(II) mediated T:T and T:G pairs” (Very Important Paper)

*Angew. Chem. Int. Ed.*, 2019, 58, 16835-16838.

*Angew. Chem.* 2019, 131, 16991–16994.

<https://doi.org/10.1002/anie.201910029>

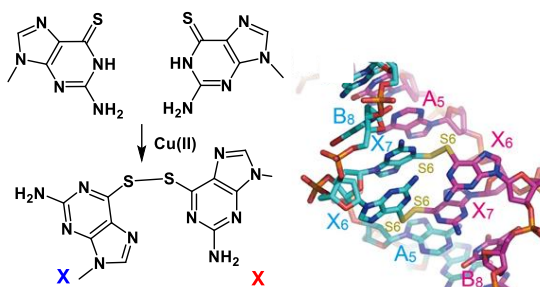


Akira Ono, Takahiro Atsugi, Misato Goto, Hisao Saneyoshi, Takahito Tomori, Kohji Seio, Takenori Dairaku and Jiro Kondo

“Crystal structure of a DNA duplex cross-linked by 6-thioguanine–6-thioguanine disulfides: reversible formation and cleavage catalyzed by Cu(II) ions and glutathione”

*RSC Adv.*, 2019, 9, 22859–22862

<https://doi.org/10.1039/C9RA03515J>

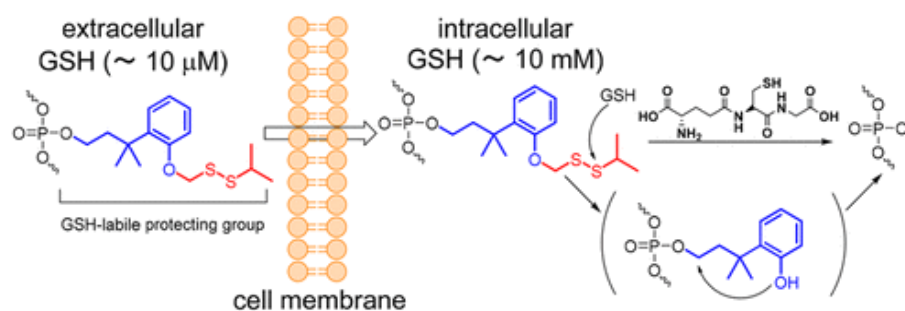


Hisao Saneyoshi, Takayuki Ohta, Yuki Hiyoshi, T. Saneyoshi, Akira Ono

“Design, synthesis and cellular uptake of oligonucleotides modified with glutathione-labile protecting groups”

*Org. Lett.*, 2019, 21, 862–866.

<https://doi.org/10.1021/acs.orglett.8b03501>



Xiwen Xing, Yihong Feng, Zutao Yu, Kumi Hidaka, Fenyong Liu, Akira Ono, Hiroshi Sugiyama,\* and Masayuki Endo

“Direct Observation of the Double-Stranded DNA Formation through Metal Ion-Mediated Base Pairing in the Nanoscale Structure”

*Chem. Eur. J.*, **2019**, *25*, 1446-1450.

<https://doi.org/10.1002/chem.201805394>

----- 2018 年 -----

Hisao Saneyoshi & Akira Ono

“Development of Protecting Groups for Prodrug-Type Oligonucleotide Medicines”

*Chem. Pharm. Bull.*, **2018**, *66*, 147-154.

<https://doi.org/10.1248/cpb.c17-00696>

----- 2017 年 -----

Akira Ono, Toru Sugawara, Hisao Saneyoshi, Jiro Kondo,

“Crystal structure of a DNA duplex containing four Ag(I) ions in consecutive dinuclear Ag(I)-mediated base pairs:

4-thiothymine–2Ag(I)–4-thiothymine”

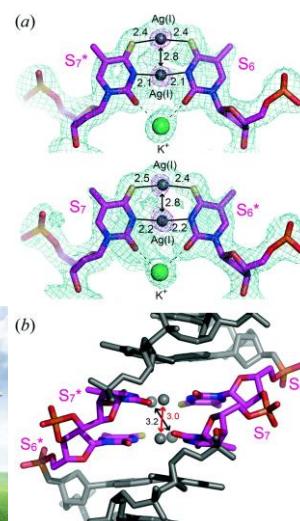
*Chem. Comm.*, **2017**, *53*, 11747 - 11750. (Cover)

DOI:10.1039/C7CC06153F

<https://doi.org/10.1039/C7CC06153F>

3F

カバーに選ばれました

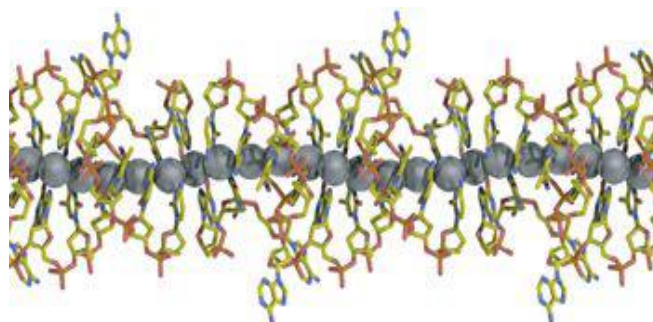


Jiro Kondo\*, Yoshinari Tada, Takenori Dairaku, Yoshikazu Hattori, Hisao Saneyoshi, Akira Ono, Yoshiyuki Tanaka

“A metallo-DNA nanowire with uninterrupted one-dimensional silver array”

*Nature Chemistry*, **2017**, *9*(10), 956-960. doi:10.1038/nchem.2808.

<https://www.nature.com/articles/nchem.2808>



Hisao Saneyoshi, Kazuhiko Kondo, Koichi Iketani, Akira Ono

"Alkyne-linked reduction-activated protecting groups for diverse functionalization on the backbone of oligonucleotides"

*Bioorg. Med. Chem.*, **2017**, 25, 3350-3356..

<https://doi.org/10.1016/j.bmc.2017.04.020>

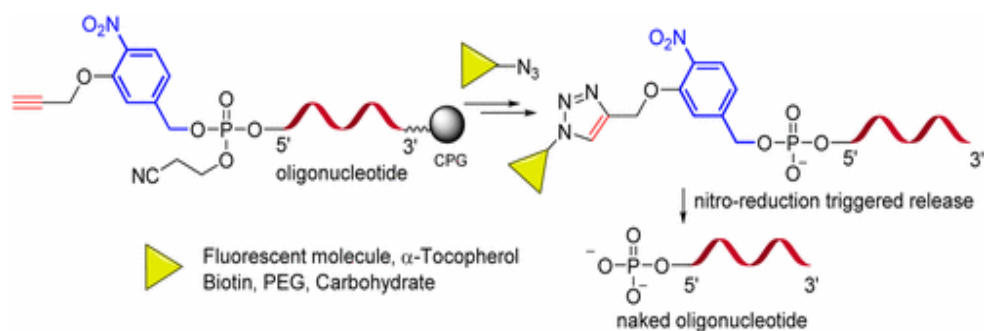
Hisao Saneyoshi, Yuta Yamamoto, Kazuhiko Kondo, Yuki Hiyoshi, Akira Ono

"Conjugatable/Bioreduction Cleavable Linker for the 5'-Functionalization of Oligonucleotides"

*J. Org. Chem.*, **2017**, 82, 1796-1802

DOI:10.1021/acs.joc.6b02527

<https://doi.org/10.1021/acs.joc.6b02527>



----- 2016 年 -----

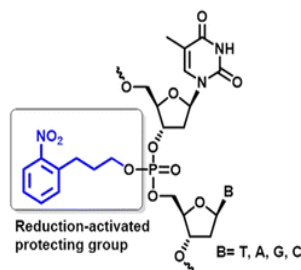
Hisao Saneyoshi, Koichi Iketani, Kazuhiko Kondo, Takeo Saneyoshi, Itaru Okamoto, and Akira Ono

"Synthesis and Characterization of Cell-Permeable Oligonucleotides Bearing Reduction-Activated Protecting Groups on the Internucleotide Linkages"

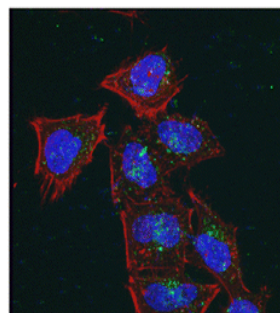
*Bioconjugate Chem.*, **2016**, 27, 2149–2156.

DOI:10.1021/acs.bioconjchem.6b00368

<https://doi.org/10.1021/acs.bioconjchem.6b00368>



Stable during ODN synthesis  
Reduction-activatable  
Nuclease resistance  
Cell-permeable



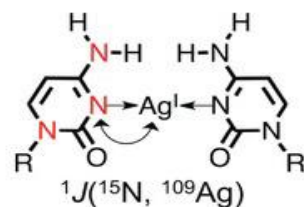
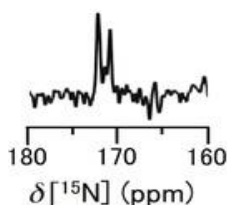
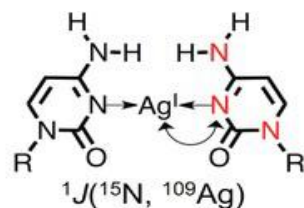
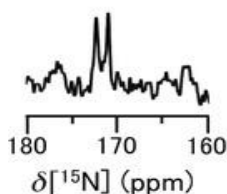
Takenori Dairaku,\* Kyoko Furuita, Hajime Sato, Jakub Šebera, Katsuyuki Nakashima, Jiro Kondo, Daichi Yamanaka, Yoshinori Kondo, Itaru Okamoto, Akira Ono, Vladimír Sychrovský,\* Chojiro Kojima,\* and Yoshiyuki Tanaka\*

“Structure Determination of an Ag<sup>I</sup>-Mediated Cytosine–Cytosine Base Pair within DNA Duplex in Solution with <sup>1</sup>H/<sup>15</sup>N/<sup>109</sup>Ag NMR Spectroscopy”

*Chem. Eur. J.* **2016**, *22*, 13028-13031.

DOI: 10.1002/chem.201603048

<https://doi.org/10.1002/chem.201603048>



Takenori Dairaku, Kyoko Furuita, Hajime Sato, Jakub Šebera, Katsuyuki Nakashima, Akira Ono, Vladimír Sychrovský, Chojiro Kojima, and Yoshiyuki Tanaka,\*

“Hg<sup>II</sup>/Ag<sup>I</sup>-mediated base pairs and their NMR spectroscopic studies”

*Inorg. Chim. Acta*, **2016**, *452*, 34-42.

(DOI: 10.1016/j.ica.2016.03.018)

<https://doi.org/10.1016/j.ica.2016.03.018>

Hisao Saneyoshi\*, Kazuhiko Kondo, Naoki Sagawa, Akira Ono\*

“Glutathione-triggered activation of the model of pro-oligonucleotide with benzyl protecting groups at the internucleotide linkage”

*Bioorg. Med. Chem. Lett.*, **2016**, *26*, 622-625.

doi:10.1016/j.bmcl.2015.11.064

<https://doi.org/10.1016/j.bmcl.2015.11.064>

Jakub Šebera, Yoshiyuki Tanaka, Akira Ono, Vladimír Sychrovský

“The effect of chemical modification of DNA base on binding of Hg-II and Ag-I in metal-mediated base pairs”

*Inorganic Chimica Acta*, **2016**, *452*, 199-204.

<https://doi.org/10.1016/j.ica.2016.03.007>

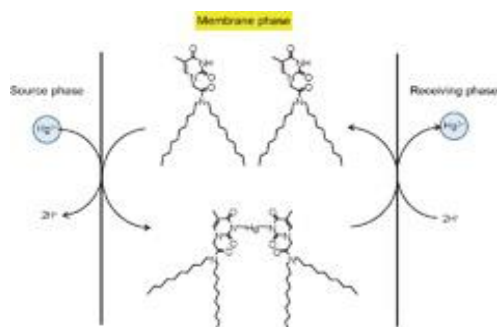
----- 2015 年 -----

Tatsuo Kurokawa,\* Manabu Igawa, Akira Ono, and Itaru Okamoto\*

“Selective Transport of Mercury(II) Ions across Supported Liquid Membrane with Thymine Derivative as Carrier”

*Chem. Lett.*, **2015**, *44*, 1732–1734.

doi:10.1246/cl.150769 <https://doi.org/10.1246/cl.150769>



Takenori Dairaku, Kyoko Furuita, Hajime Sato, Yoshinori Kondo, Chojiro Kojima, Akira Ono & Yoshiyuki Tanaka\*

“Exploring a DNA Sequence for the Three-Dimensional Structure Determination of a Silver(I)-Mediated C-C Base Pair in a DNA Duplex By 1H NMR Spectroscopy”

*Nucleosides Nucleotides Nucleic Acids.* **2015**, *34* (12), 877-900.

DOI:10.1080/15257770.2015.1088160

<https://doi.org/10.1080/15257770.2015.1088160>

Hisao Saneyoshi,\* Yuki Hiyoshi, Koichi Iketani, Kazuhiko Kondo, Akira Ono\*

“Bioreductive deprotection of protected thymine bases in oligonucleotides for the activation of duplex formation”

*Bioorg. Med. Chem. Lett.*, **2015**, *25*, 5632-5635.

<https://doi.org/10.1016/j.bmcl.2015.10.025>

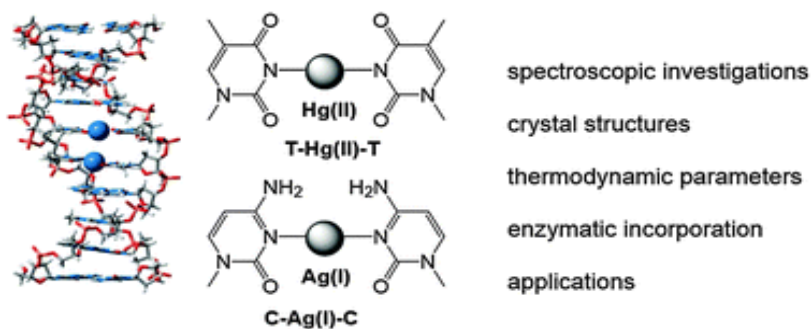
Yoshiyuki Tanaka,\* Jiro Kondo, Vladimír Sychrovský, Jakub Šebera, Takenori Dairaku, Hisao Saneyoshi, Hidehito Urata, Hidetaka Torigoe and Akira Ono\*

“Structures, physicochemical properties, and applications of T–Hg<sup>II</sup>–T, C–Ag<sup>I</sup>–C, and other metallo-base-pairs”

*Chem. Comm.*, **2015**, *51*(98), 17343-17360. “Feature Article”

DOI: 10.1039/C5CC02693H

<https://doi.org/10.1039/C5CC02693H>



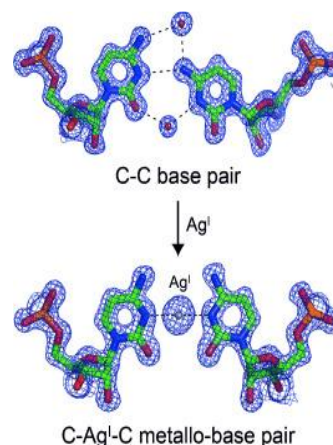
Jiro Kondo\*, Yoshinari Tada, Takenori Dairaku, Hisao Saneyoshi, Itaru Okamoto, Yoshiyuki Tanaka,  
Akira Ono

“High-resolution crystal structure of Ag<sup>I</sup>-RNA hybrid duplex containing Watson-Crick-like C–Ag<sup>I</sup>–C metallo-base pairs”

*Angew. Chem. Int. Ed.*, **2015**, *54*, Issue 45, 13323–13326.

(10.1002/anie.201507894)

<https://doi.org/10.1002/ange.201507894>

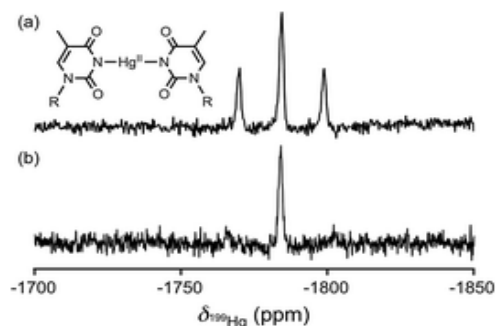


Takenori Dairaku, Kyoko Furuita, Hajime Sato, Jakub Šebera, Daichi Yamanaka, Hiroyuki Otaki, Shoko Kikkawa, Yoshinori Kondo, Ritsuko Katahira, F. Matthias Bickelhaupt, Célia Fonseca Guerra, Akira Ono, Vladimír Sychrovský, Chojiro Kojima, and Yoshiyuki Tanaka  
“Direct detection of the mercury–nitrogen bond in the thymine–Hg<sup>II</sup>–thymine base-pair with <sup>199</sup>Hg NMR spectroscopy”

*Chem. Comm.*, **2015**, *51*, 8488-8491.

DOI: 10.1039/C5CC02423D

<https://doi.org/10.1039/C5CC02423D>



Hisao Saneyoshi,\* Kanami Shimamura, Naoki Sagawa, Yuki Ando, Takahito Tomori, Itaru Okamoto, Akira Ono\*

“Development of a photolabile protecting group for phosphodiester in oligonucleotides”

*Bioorg. Med. Chem. Lett.*, **2015**, *25*, 2129-2132.

<https://doi.org/10.1016/j.bmcl.2015.03.064>

-----2014年-----

Mitsuhiro Kuriyama, Kaichiro Haruta, Takenori Dairaku, Takuya Kawamura, Shoko Kikkawa, Kiyofumi Inamoto, Hirokazu Tsukamoto, Yoshinori Kondo, Hidetaka Torigoe, Itaru Okamoto, Akira Ono, Eugene Hayato Morita, Yoshiyuki Tanaka

“Hg<sup>2+</sup>-Trapping Beads: Hg<sup>2+</sup>-Specific Recognition through Thymine–Hg(II)–Thymine Base Pairing”

*Chem. Pharm. Bull.*, **2014**, 62, 709–712.

<https://doi.org/10.1248/cpb.c13-00918>

Tatsuya Funai, Junko Nakamura, Yuki Miyazaki, Risa Kiri, Osamu Nakagawa, Shunichi Wada, Akira Ono, and Hidehito Urata\*

“Regulated Incorporation of Two Different Metal Ions into Programmed Sites in a Duplex by DNA Polymerase Catalyzed Primer Extension” *Angew. Chem. Int. Ed.*, **2014**, 53, 6624–6627.

DOI: 10.1002/anie.201311235

<https://doi.org/10.1002/anie.201311235>

J. Kondo, T. Yamada, C. Hirose, I. Okamoto, Y. Tanaka, A. Ono,

“Crystal structure of metallo-DNA duplex containing consecutive Watson-Crick-like T–Hg(II)–T base pairs”

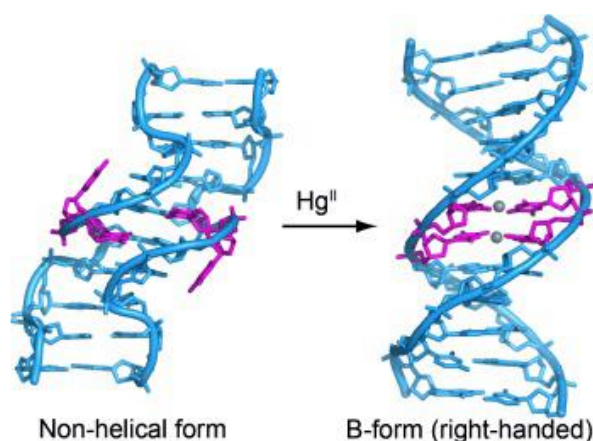
*Angew. Chem. Int. Ed.*, **2014**, 53, 2385–2388.

<https://doi.org/10.1002/anie.201309066>

International Ed., DOI: 10.1002/anie.201309066

10.1002/ange.201309066

<https://doi.org/10.1002/anie.201309066>



H. Yamaguchi, J. Šebera, J. Kondo, S. Oda, T. Komuro, T. Kawamura, T. Dairaku, Y. Kondo, I. Okamoto, A. Ono, J. V. Burda, C. Kojima, V. Sychrovský and Y. Tanaka,

“The structure of metallo-DNA with consecutive thymine–Hg<sup>II</sup>–thymine base pairs explains positive entropy for the metallo base pair formation”

*Nucleic Acids Research*, **2014**, 42, 4094–4099.

doi:10.1093/nar/gkt1344 <https://doi.org/10.1093/nar/gkt1344>



-----2013年-----

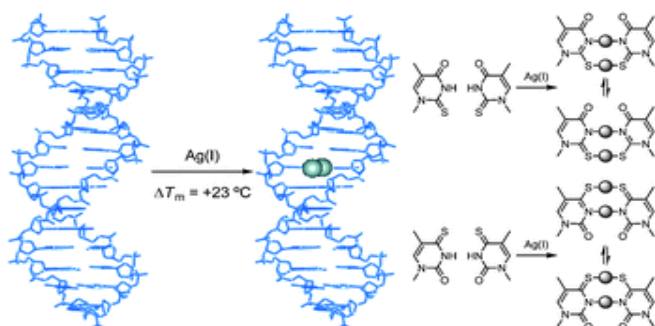
Jakub Šebera, Jaroslav Burda, Michal Straka, Akira Ono, Chojiro Kojima, Yoshiyuki Tanaka, and Vladimír Sychrovský\*

“Formation of a Thymine-HgII-Thymine Metal-Mediated DNA Base Pair: Proposal and Theoretical Calculation of the Reaction Pathway” *Chem. Eur. J.*, **2013**, *19*, 9884 – 9894. 10.1002/chem.201300460

-----2012年-----

Itaru Okamoto\*, Takashi Ono, Rimi Sameshima and Akira Ono\*

“Metal ion-binding properties of DNA duplexes containing thiopyrimidine base pairs” *Chem. Commun.*, (2012) **48**, 4347-4349. <https://doi.org/10.1039/C2CC15436F>



Tomomi Uchiyama#, Takashi Miura#, Hideo Takeuchi, Takenori Dairaku, Tomoyuki Komuro, Takuya Kawamura, Yoshinori Kondo, Ladislav Benda, Vladimír Sychrovský\*, Petr Bour, Itaru Okamoto\*, Akira Ono and Yoshiyuki Tanaka\*,

“Raman spectroscopic detection of the T-HgII-T base pair and the ionic characteristics of mercury”

*Nucleic Acids Research*, (2012), **40**, 5766-5774. <https://doi.org/10.1093/nar/gks208>

Tatsuya Funai, Yuki Miyazaki, Megumi Aotani, Eriko Yamaguchi, Osamu Nakagawa, Shunichi Wada, Hidetaka Torigoe, Akira Ono, and Hidehito Urata\*

“Ag<sup>I</sup> Ion Mediated Formation of a C–A Mismatch by DNA Polymerases”

*Angew. Chem. Int. Ed.*, (2012), **51**, 6464 –6466. <https://doi.org/10.1002/anie.201109191>

Hidetaka Torigoe,\* Itaru Okamoto, Takenori Dairaku, Yoshiyuki Tanaka, Akira Ono, T. Kozasa,

“Thermodynamic and structural properties of the specific binding between Ag<sup>+</sup> ion and C:C mismatched base pair in duplex DNA to form C-Ag-C metal-mediated base pair”

*Biochimie*, (2012) , **94**, 2431-2440. <https://doi.org/10.1016/j.biochi.2012.06.024>

Hidetaka Torigoe, Yukako Miyakawa, Akira Ono, Tetsuo Kozasa

“Positive cooperativity of the specific binding between Hg<sup>2+</sup> ion and T:T mismatched base pairs in duplex DNA”

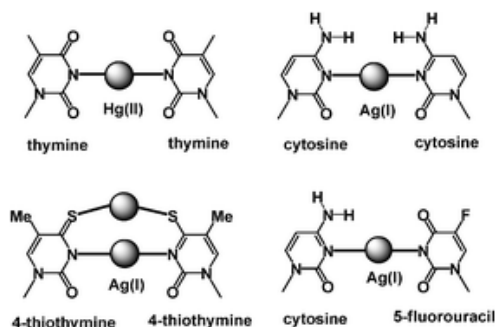
*Thermochimica Acta* (2012) 532, 28– 35. <https://doi.org/10.1016/j.tca.2011.03.018>

-----2011年-----

A. Ono, H. Torigoe, Y. Tanaka, I. Okamoto

"Binding of metal ions by pyrimidine base pairs in DNA duplexes" *Chem. Soc. Rev.*, (2011) 40, 5855-5866.

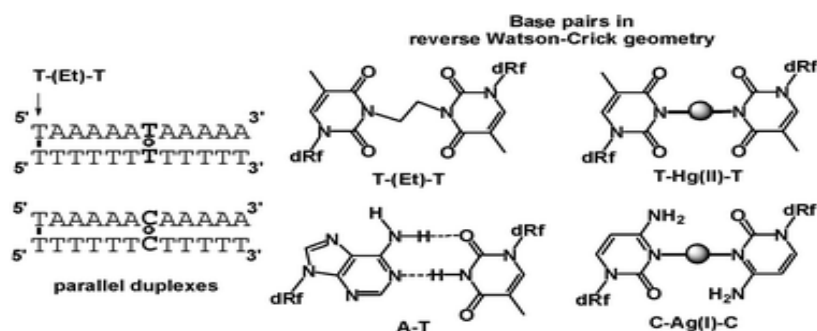
<https://doi.org/10.1039/C1CS15149E>



T. Ono, K. Yoshida, Y. Saotome, R. Sakabe, I. Okamoto, A. Ono\*

"Synthesis of covalently linked parallel and antiparallel DNA duplexes containing the metal-mediated base pairs T-Hg(II)-T and C-Ag(I)-C" *Chem. Comm.*, (2011), 47 (5), 1542-1544.

<https://doi.org/10.1039/C0CC02028A>



Torigoe, H., Miyakawa, Y., Ono, A., and Kozasa, T.

"Thermodynamic Properties of the Specific Binding between Ag<sup>+</sup> Ions and C:C Mismatched Base Pairs in Duplex DNA"

*Nucleosides, Nucleotides, & Nucleic Acids*, **30**(2), 149-167 (2011). doi: 10.1080/15257770.2011.553210

Torigoe, H., Ono, A., and Kozasa, T.

"Detection of Single Nucleotide Polymorphisms by the Specific Interaction between Transition Metal Ions and Mismatched Base Pairs in Duplex DNA"

*Transition Metal Chemistry*, **36**(2), 121-144 (2011). DOI: 10.1007/s11243-010-9445-z

----- 2010 年度 -----

Hidetaka Torigoe, Akira Ono, and Tetsuo Kozasa

“Hg(II) Ion Specifically Binds with T:T Mismatched Base Pair in Duplex DNA”

*Chem. Eur. J.*, **2010**, *16*, 13218-13225. <https://doi.org/10.1002/chem.201001171>

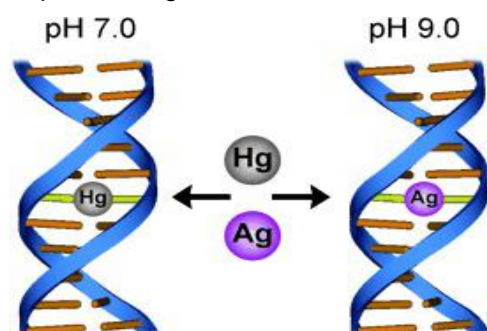
----- 2009 年度 -----

Itaru Okamoto, Kenji Iwamoto, Yuko Watanabe, Yoko Miyake, Akira Ono

“Switching Metal Ion Binding Selectivity of Chemically Modified Uracil Pairs in DNA Duplexes Triggered by pH Change”

*Angew. Chem. Int. Ed.*, **2009**, *48*, 1648-1651.

<https://doi.org/10.1002/anie.200804952>



Yoshiyuki Tanaka\* and Akira Ono\*, Structural Studies on Mercury<sup>II</sup>-mediated T-T Base-pair with NMR Spectroscopy (Chapter 16), In Nick Hadjiladis and Einar Sletten Eds.,

**"Metal Complexes - DNA Interactions"**,

John Wiley & Sons, West Sussex, UK (2009). ISBN: 978-1-4051-7629-3 (英文著書)

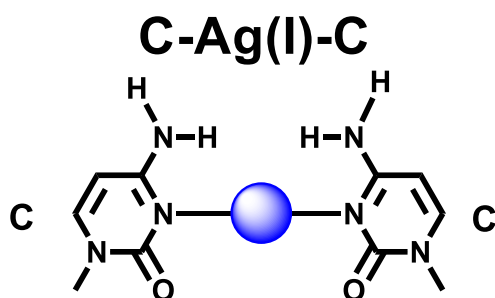
----- 2008 年度 -----

Akira Ono\*, Shiqi Cao, Humika Togashi, Mitsuru Tashiro, Takashi Fujimoto, Tomoya Machinami, Shuji Oda, Yoko Miyake, Itaru Okamoto, and Yoshiyuki Tanaka

“Specific interactions between Silver(I) Ions and Cytosine–Cytosine Pairs in DNA Duplexes”

*Chem. Comm.*, (2008), 4825-4827. (22 Aug 2008)

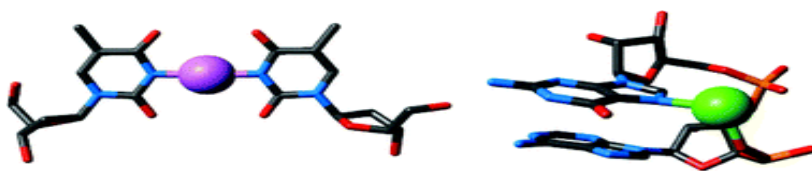
<https://doi.org/10.1039/B808686A>



Yoshiyuki Tanaka\* and Akira Ono\*

“Nitrogen-15 NMR spectroscopy of N-metallated nucleic acids: insights into  $^{15}\text{N}$  NMR parameters and N–metal bonds”

*Dalton Trans.*, (2008), issue 37, 4965–4974. <https://doi.org/10.1039/B803510P>



田中好幸、鳥越秀峯、小野 晶

「新規ナノデバイス材料としてのメタロ DNA 分子の構造」

生物物理、48 (2)、119-124 (2008)

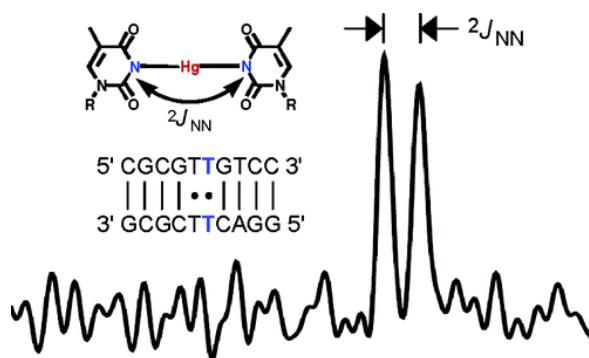
<https://doi.org/10.2142/biophys.48.119>

----- 2007 年度 -----

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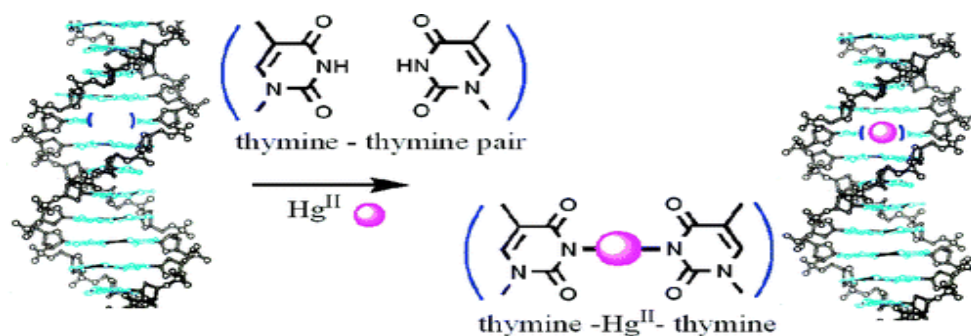
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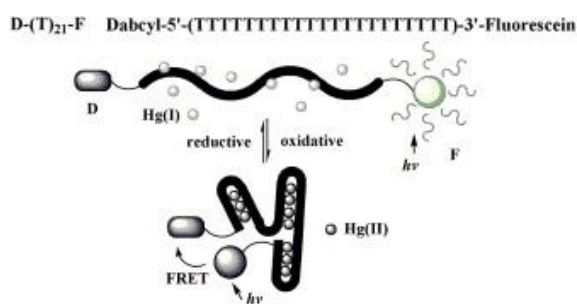
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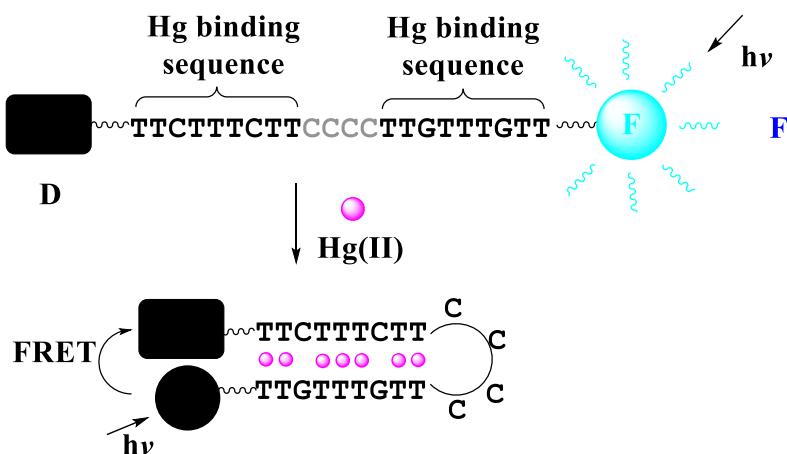
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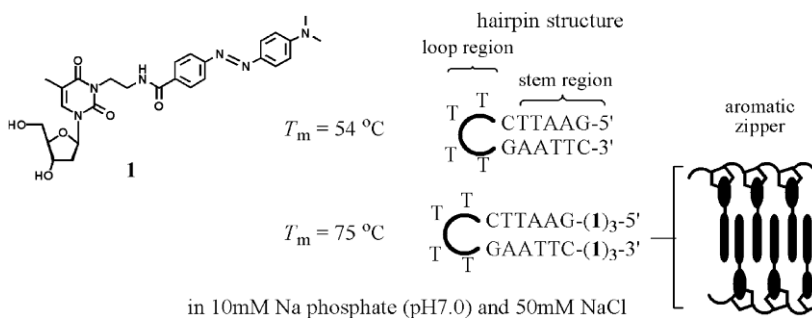


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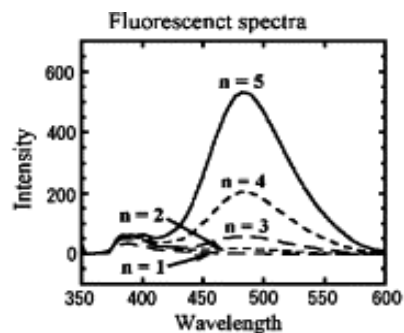
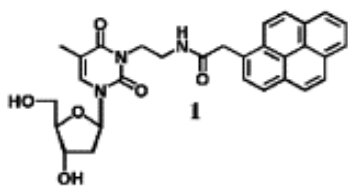
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5'-(1)n-CACTGCATTGGTCAC-3'

n = 0 ~ 5



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