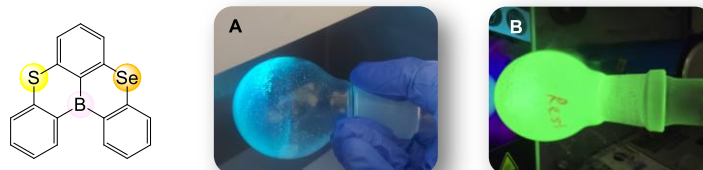


Publications are given in chronological order.

(45) Facile Synthetic Access Towards Sulfur- and Selenium-Functionalized Boron-Based Multiresonance TADF Emitters

Zeynep Güven, Hadi Dolati, Leo Wessel, René Frank*, *Molecules* **2024**, *29*, 5819. DOI: org/10.3390/molecules29245819.

We herein present a facile access towards sulfur- and selenium-functionalized triarylboranes, which are highly sought-after materials as multiresonance TADF emitters. In particular, the syntheses of selenium containing borane afford highly satisfying yields.



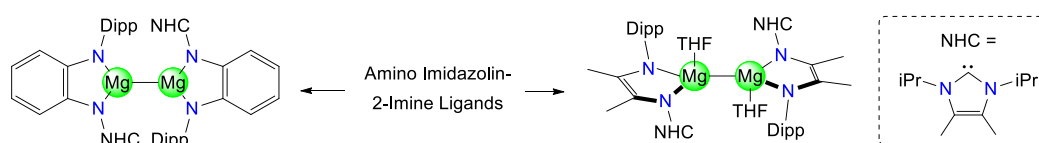
(44) Gold(I) and Gold(III) Carbene Complexes from the Marine Betaine Norzooanemonin: Inhibition of Thioredoxin Reductase, Antiproliferative and Antimicrobial Activity

Seyedeh Mahbobeh Mahdavi, Dirk Bockfeld, Igor V. Esarev, Petra Lippmann, René Frank, Mark Brönstrup, Ingo Ott, and Matthias Tamm*, *RSC Med. Chem.* **2024**, *15*, 3248–3255. DOI: 10.1039/d4md00358.

(43) Amino Imidazolin-2-imine Ligands in Magnesium Complexes: Approaches Towards Low-Valent Mg(I) Species

Lars Denker, Hadi Dolati, Mario Barthen, René Frank*, *Z. Anorg. Allg. Chem.* **2024**, *650*, e202300247. DOI: org/10.1002/zaac.202300247.

Amino imidazolin-2-imine ligands support magnesium(I) complexes, in analogy to well-known β -diketiminate architectures.



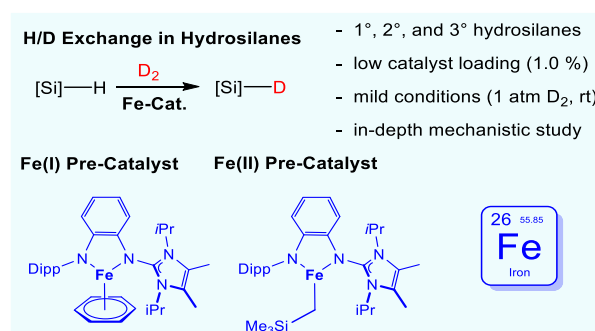
(42) Synthesis of N-heterocyclic carbene gold(I) complexes from the marine betaine 1,3-dimethylimidazolium-4-carboxylate

Seyedeh Mahbobeh Mahdavi, Dirk Bockfeld, Rolf Büssing, Bianka Karge, Thomas Bannenberg, René Frank, Mark Brönstrup, Ingo Ott, Matthias Tamm*, *Dalton Trans.* **2024**, *53*, 1942–1946. DOI: org/10.1039/D3DT04135B.

(41) Iron(I) and Iron(II) Amido-imidazolin-2-imine Complexes as Catalysts for H/D Exchange in Hydrosilanes

Noor U Din Reshi, Dirk Bockfeld, Dirk Baabe, Lars Denker, Juan Pablo Martínez, Bartosz Trzaskowski,* René Frank,* Matthias Tamm*, *ACS Catalysis* **2024**, *14*(3), 1759–1772. DOI: [org/10.1021/acscatal.3c05355](https://doi.org/10.1021/acscatal.3c05355).

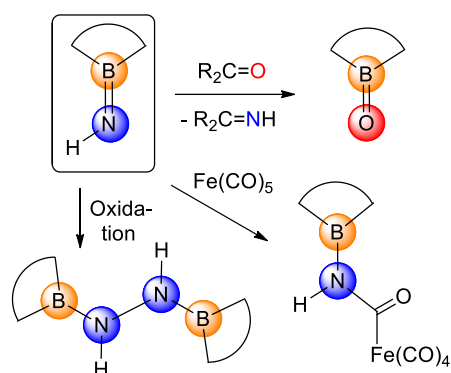
Amido-imidazolin-2-imine ligands support iron(I) and iron(II) complexes, which are demonstrated as efficient (pre)catalysts for the H/D exchange in hydrosilanes.



(40) Iminoboranes With Parent B=NH Entity: Imino Group Metathesis, Nucleophilic Reactivity and N–N Coupling

Hadi Dolati, Lars Denker, Juan Pablo Martínez, Bartosz Trzaskowski,* René Frank*, *Chem. Eur. J.* **2023**, *29*, e202302494. DOI: [org/10.1002/chem.202302494](https://doi.org/10.1002/chem.202302494).

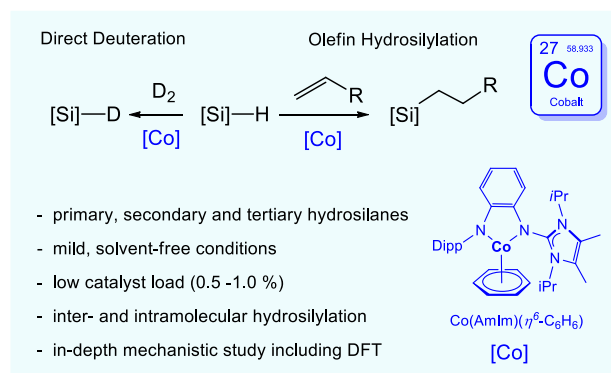
In this contribution the aminoimidazolin-2-imine ligand is applied afford parent iminoboranes with B=NH bond motif. The study presents a broad scope of reactivity including bond metathesis, nucleophilic addition and oxidative N–N coupling.



(39) Cobalt(I)-Catalyzed Transformation of Si–H Bonds: H/D Exchange in Hydrosilanes and Hydrosilylation of Olefins

Lars Denker, Daniela Wullschläger, Juan Pablo Martínez, Stanisław Świerczewski, Bartosz Trzaskowski,* Matthias Tamm,* René Frank*, *ACS Catalysis*, **2023**, *13*(4), 2586–2600. DOI: [org/10.1021/acscatal.2c06259](https://doi.org/10.1021/acscatal.2c06259).

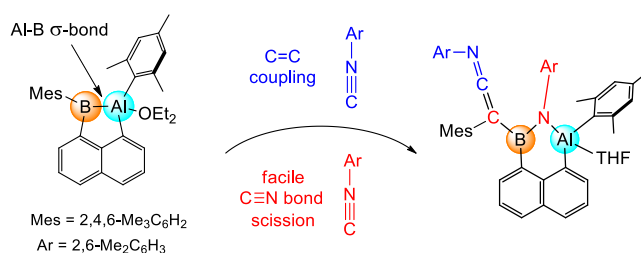
In this contribution the aminoimidazolin-2-imine ligand is applied to cobalt as a base metal. The resulting complexes are superior over analogous β -diketiminate complexes of cobalt in H/D exchange reactions in hydrosilanes and hydrosilylation reactions of olefins.



(38) Reductive Al–B σ -Bond Formation in Alumaboranes: Facile Scission of Polar Multiple Bonds

Zeynep Güven, Lars Denker, Daniela Wullschläger, Juan Pablo Martínez, Bartosz Trzaskowski,* René Frank*, *Angew. Chem. Int. Ed.* **2022**, *61*, e202209502. DOI: [org/10.1002/anie.202209502](https://doi.org/10.1002/anie.202209502).

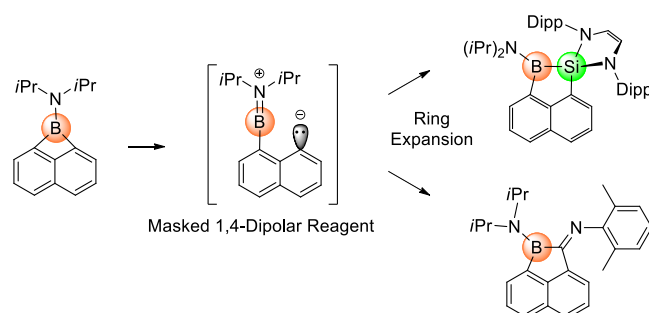
A novel access toward electron precise Al–B σ -bond in alumaboranes is presented employing the 1,8-disubstituted naphthalene backbone. In contrast to well-established Al–C σ -bonds in organometallic reagents, Al–B σ -bonds are extremely rare and tend to display completely different reactivity as demonstrated by double (C=O, C=S) and triple bond (C \equiv N) scission in selected substrates.



(37) **Reactions of a Four-Membered Borete with Carbon, Silicon, and Gallium Donor Ligands: Fused and Spiro-Type Boracycles**

Zeynep Güven, Lars Denker, Hadi Dolati, Daniela Wullschläger, Bartosz Trzaskowski,* and René Frank*, *Chem. Eur. J.* **2022**, e202200673.

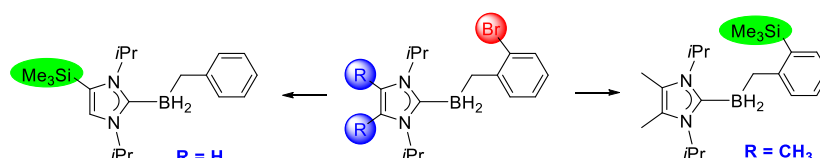
DOI: [org/10.1002/chem.202200673](https://doi.org/10.1002/chem.202200673).



(36) **Metal Halide Exchange in Benzylborane NHC-Adducts: The Effect of Backbone Alkylation in the *N*-Heterocyclic Carbene**

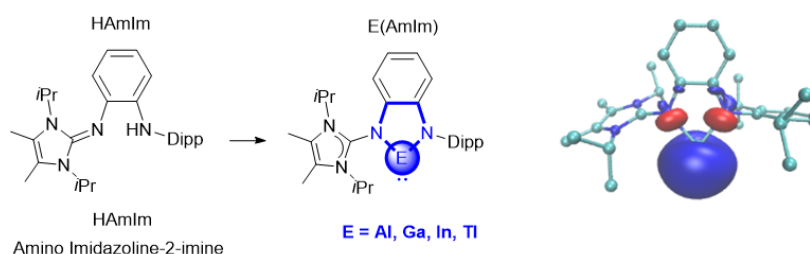
Daniela Wullschläger, Lars Denker, René Frank*, *Z. Anorg. Allg. Chem.* **2022**, e202200018 (1 of 5). DOI: [org/10.1002/zaac.202200018](https://doi.org/10.1002/zaac.202200018).

Same Conditions – Different Outcome. A lithiation - silylation procedure at *ortho*-brominated benzylborane adducts strongly depends on the *N*-heterocyclic carbene (NHC) used. The alkylation of the backbone controls the final position of the trimethylsilyl group.



(35) **“Give Me Five” - An Amino Imidazoline-2-imine Ligand Stabilises First Neutral Five-membered Cyclic Triel(I) Carbenoids**

Lars Denker, Bartosz Trzaskowski*, René Frank*, *Chem. Commun.* **2021**, 57, 2816–2819. DOI: [org/10.1039/D1CC00010A](https://doi.org/10.1039/D1CC00010A).

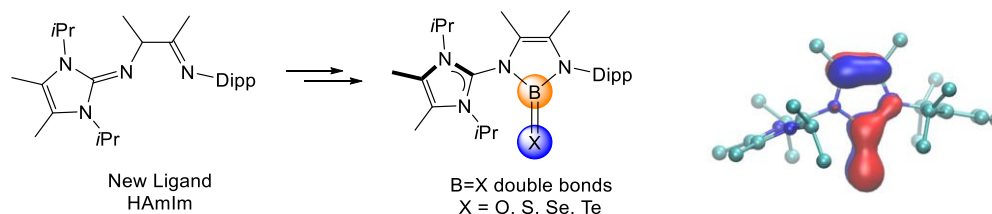


(34) **Superseding β -Diketiminato Ligands: An Amido Imidazoline-2-Imine Ligand Stabilizes the Exhaustive Series of $B=X$ Boranes ($X = O, S, Se, Te$)**

Hadi Dolati, Lars Denker, Bartosz Trzaskowski*, René Frank*, *Angew. Chem. Int. Ed.* **2021**, *60*, 4633–4639. **Hot Paper**.

DOI: [org/10.1002/anie.202015553](https://doi.org/10.1002/anie.202015553).

We present a novel monoanionic N,N' -chelating ligand with properties superior to β -diketiminato ligands. The new system was applied to stabilize the exhaustive series of boranes isoelectronic and chemically akin to ketones and their heavier analogues.

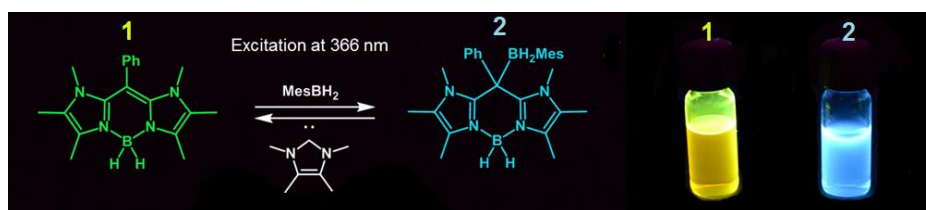


(33) **Two π -Electrons Make the Difference - From BODIPY to BODIIM Switchable Fluorescent Dyes**

Hadi Dolati, Lisa C. Haufe, Lars Denker, Andreas Lorbach, Robin Grotjahn, Gerald Hörner*, René Frank*, *Chem. Eur. J.* **2020**, *26*, 1422–1428.

DOI: [10.1002/chem.201905344](https://doi.org/10.1002/chem.201905344).

The modification of the 12 π -electron system in widely established BODIPY fluorescent dyes by two nitrogen atoms afforded a 14 π -electron system and results in the unprecedented fluorescent dye class termed BODIIM. This novel system displays Stokes-shifts, which are at least eight 8 times higher than in BODIPY systems, and shows switchable fluorescent properties upon the addition of Lewis-acids.

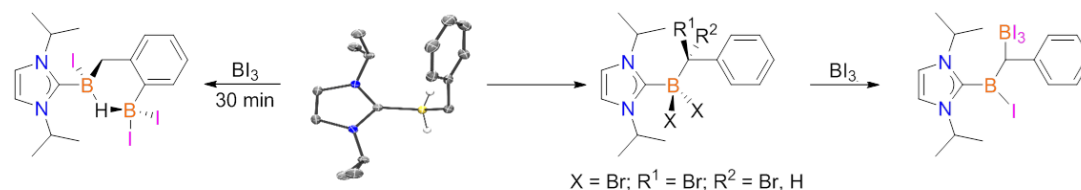


(32) **Benzyl Borane NHC Adducts: Beyond B–C Bond Scission**

Richard Böser, Lars Denker, René Frank*, *Chem. Eur. J.* **2019**, *25*, 10575–10579.

DOI: [org/10.1002/chem.201902698](https://doi.org/10.1002/chem.201902698).

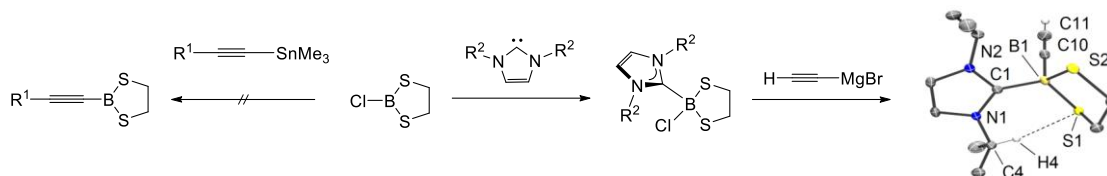
The chemistry of benzyl boranes is currently poorly investigated. We present interesting reaction of adducts of NHC-benzylboranes with boron halides. In particular, reactions with BI_3 a 1,2 bisborylated benzene or a zwitterionic BI_3 -functionalized products.



(31) **N-Heterocyclic Carbene Adducts of Alkynyl Functionalized 1,3,2-Dithioborolanes**

Richard Böser, Lars Denker, René Frank*, *Molecules* **2019**, 24(9), 1690 (1–8).
DOI: 10.3390/molecules24091690.

Contributions of our group to the chemistry of 1,3,2-dithioborolanes and their alkynylation reactions.

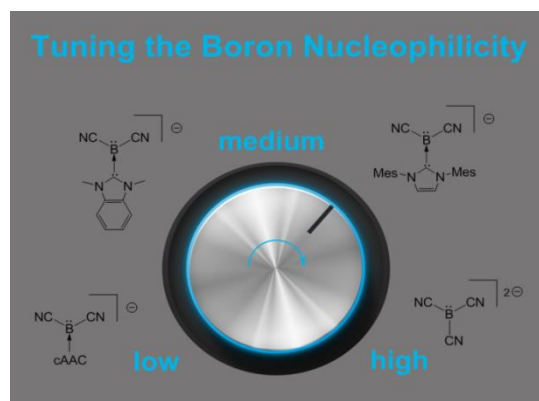
(30) **Spectroscopic, XRD, Hirshfeld surface and DFT approach (chemical activity, ECT, NBO, FFA, NLO, MEP, NPA, MPA) of (E)-4-bromo-2-[(4-bromophenylimino)methyl]-6-ethoxyphenol**

Zeynep Demircioğlu,* Gökhan Kaştaş, Çiğdem Albayrak Kaştaş, René Frank, *J. Mol. Struct.* **2019**, 1191, 129–137. DOI: 10.1016/j.molstruc.2019.03.060.

(29) **Completing the Series of Boron-Nucleophilic Cyanoborates: Boryl Anions of Type NHC-B(CN)₂⁻**

Richard Böser, Lisa C. Haufe, Matthias Freytag, Peter G. Jones, Gerald Hörner*, René Frank*, *Chem. Sci.* **2017**, 8, 6274–6280. DOI: 10.1039/C7SC02238G.

Compounds with boron-centered nucleophilicity are rare and our contributions involve the synthesis of novel boryl anions of type NHC-B(CN)₂ to complete the series of cyanoborates with continuously varying strength boron-nucleophilic behavior. Reactions with electrophiles demonstrate the chemical reactivity as boron nucleophiles. **The content of this paper was presented at the “International Conference on Phosphorus, Boron and Silicon – PBSi 2018” by Richard Böser, who received the award for the best oral contribution.**

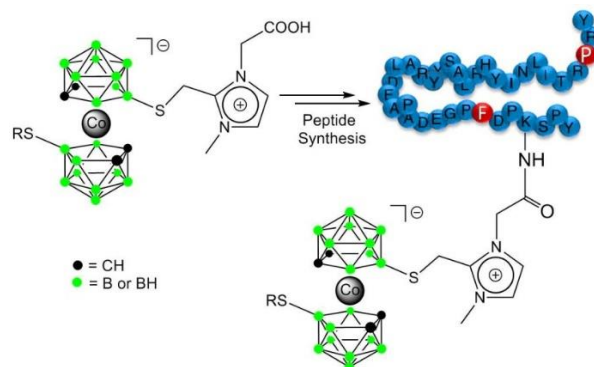
(28) **Chiral Rhodium(I) Complexes of 1,2-Bis-(chloroalkoxyphosphanyl)- and 1,2-Bis-(amidoalkoxyphosphanyl)-1,2-dicarba-c/oso-dodecaboranes(12)**

Sebastian Bauer, Ilham Maulana, Peter Coburger, Steffen Tschirschwitz, Peter Loennecke, Peter, Menyhart B. Sarosi, René Frank, Evamarie Hey-Hawkins*, *ChemistrySelect*, **2017**, 2, 7407–7416. DOI: 10.1002/slct.201701630.

(27) Charge-Compensated Metallocarborane Building Blocks for Conjugation with Peptides

René Frank, Verena M. Ahrens, Solveig Boehnke, Annette G. Beck-Sickinger*, Evamarie Hey-Hawkins*, *ChemBioChem* **2016**, 17, 308–317.
DOI: [org/10.1002/cbic.201500569](https://doi.org/10.1002/cbic.201500569).

The bio-conjugation of sulfur-functionalised cobaltacarborane clusters to the breast tumour-selective neuropeptide Y (NPY) and its derivatives was demonstrated, which suggest application in the treat of breast cancer by the highly efficient method of boron neutron capture therapy (BNCT).



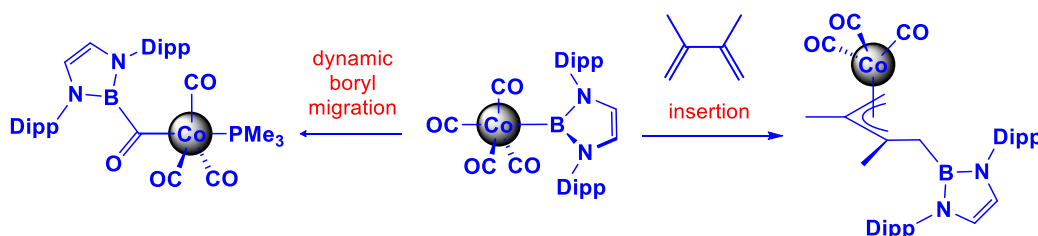
(26) A Convenient Route towards Deoxygalactosyl-Functionalised *ortho*-Carbaborane: Synthesis of a Building Block for Peptide Conjugation

René Frank, Evamarie Hey-Hawkins*, *J. Organomet. Chem.* **2015**, 98, 46–50.
DOI: [10.1016/j.jorganchem.2015.08.011](https://doi.org/10.1016/j.jorganchem.2015.08.011).

(25) Cobalt Boryl Complexes: Enabling and Exploiting Migratory Insertion in Base-Metal-Mediated Borylation

René Frank*, James Howell, Jésus Campos, Rémi Tirfoin, Nicholas Phillips, Stefan Zahn, D. Michael P. Mingos, Simon Aldridge*, *Angew. Chem. Int. Ed.* **2015**, 54, 9586–9590.
DOI: [10.1002/anie.201504929](https://doi.org/10.1002/anie.201504929).

The insertion of CO into M–R bonds is a key fundamental step in organometallic chemistry but is hitherto unknown for the boryl ligands, whereas the reverse de-insertion of CO from bora-acyl complexes is invariably spontaneous. We demonstrate CO migratory insertion in cobalt boryl complexes and show applications thereof in alkene functionalization – a well-known reaction for noble metals such as rhodium or platinum.



(24) Carbaboranes – More than just Phenyl Mimetics

René Frank, Verena M. Ahrens, Solveig Boehnke, Sven Hofmann, Martin Kellert, Stefan Saretz, Souvik Pandey, Menyhárt Sárosi, Ágota Bartók, Annette G. Beck-Sickinger*, Evamarie Hey-Hawkins*, *Pure and Applied Chemistry* **2015**, 87(2), 163–171.
DOI: [10.1515/pac-2014-1006](https://doi.org/10.1515/pac-2014-1006).

(23) **Receptor-Mediated Uptake of Boron-Rich Neuropeptide-Y Analogues for Boron Neutron Capture Therapy**

Verena M. Ahrens, René Frank, Solveig Boehnke, Christian L. Schütz, Gabriele Hampel, Dorothée S. Iffland, Nicolas H. Bings, Evamarie Hey-Hawkins*, Annette G. Beck-Sickinger*, *ChemMedChem* **2015**, *10*(1), 164–172. DOI:10.1002/cmdc.201402368. Joint first authors.

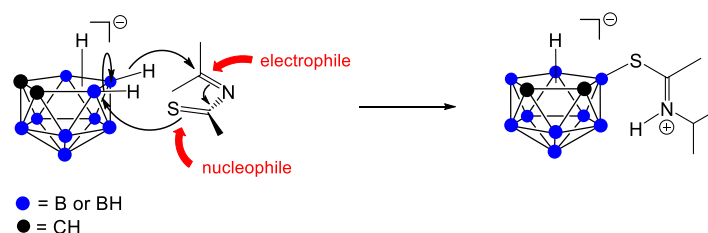
(22) **Carbaborane-Substituted 1,2,3-Triphospholanes and 1-Aza-2,5-diphospholane: New Synthetic Approaches**

Anika Kreienbrink, Sarah Heinicke, Thi Thuy Duong Pham, René Frank, Peter Lönnecke, Evamarie Hey-Hawkins*, *Chemistry - A European Journal* **2014**, *20*(5), 1434–1439. DOI:10.1002/chem.201302878.

(21) **Electrophile-Induced Nucleophilic Substitution of the *nido*-Dicarbaundecaborate Anion *nido*-7,8-C₂B₉H₁₂[−] by Conjugated Heterodienes**

René Frank, Anup Kumar Adhikari, Henry Auer, Evamarie Hey-Hawkins*, *Chemistry - A European Journal*, **2014**, *20*(5), 1440–1446. DOI:10.1002/chem.201303762.

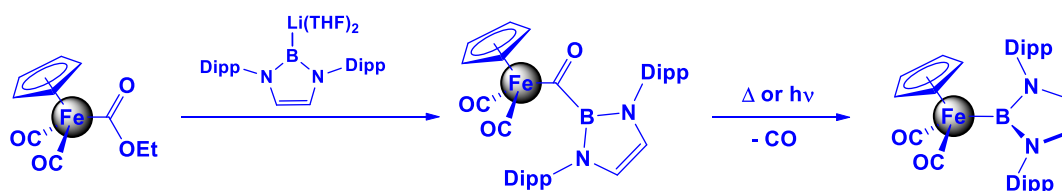
In a contribution to the chemistry of *nido*-7,8-C₂B₉H₁₂[−] we report its functionalisation in reactions with conjugated heterodienes, in which the latter display ambident behaviour as a hydride acceptor and nucleophile.



(20) **Circumventing Redox Chemistry: Synthesis of Transition Metal Boryl Complexes from a Boryl Nucleophile by Decarbonylation**

René Frank*, James Howell, Rémi Tirfoin, Deepak Dange, Cameron Jones, D. Michael P. Mingos, Simon Aldridge*, *J. Am. Chem. Soc.* **2014**, *136*(44), 15730–15741. DOI:10.1021/ja508979x.

The formation of transition metal boryl complexes employing nucleophilic boron compounds is often hampered by the strong inherent reduction potential of the boron reagents. We present a novel approach to prevent the reduction with the formation of the novel class of bora-acyl complexes, which undergo extrusion of CO at thermal or photolytic conditions.

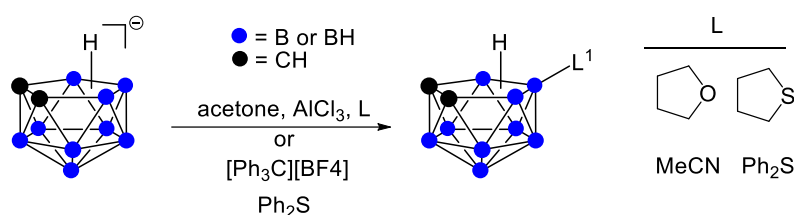


- (19) **The Prototropic Tautomerism and Substituent Effect through strong Electron-withdrawing Group in (*E*)-5-(Diethylamino)-2-[(3-nitrophenylimino)methyl]phenol**

Çiğdem Albayrak*, Gökhan Kaştaş, Mustafa Odabaşoğlu*, René Frank, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* **2013**, *114*, 205–213.
DOI:10.1016/j.saa.2013.05.044.

- (18) **Functionalisation of the *nido*-dicarbaborate anion *nido*-7,8-C₂B₉H₁₂[−] by hydride abstraction**

René Frank, Henry Auer, Evamarie Hey-Hawkins*, *Journal of Organometallic Chemistry* **2013**, *747*, 217–224. DOI:10.1016/j.jorganchem.2013.04.031.



- (17) **Terminal Alkylphosphanilidene Organotantalum(V) Complexes**

Anne Grundmann, Menyhárt B. Sárosi, Peter Lönnecke, René Frank, Evamarie Hey-Hawkins*, *European Journal of Inorganic Chemistry* **2013**, *18*, 3137–3140.
DOI:10.1002/ejic.201300500.

- (16) **Imitation and Modification of Bioactive Lead Structures via Integration of Boron Clusters**

Sven Stadlbauer, René Frank, Matthias Scholz, Solveig Boehnke, Verena M. Ahrens, Annette G. Beck-Sickinger*, Evamarie Hey-Hawkins*, *Pure and Applied Chemistry* **2012**, *84*(11), 2289–2298. DOI:10.1351/PAC-CON-11-11-02.

- (15) **Survey of Conformational Isomerism in (*E*)-2-[(4-Bromophenylimino)methyl]-5-(diethylamino)phenol Compound from Structural and Thermochemical Points of View**

Çiğdem Albayrak, Gökhan Kaştaş, Mustafa Odabaşoğlu*, René Frank, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* **2012**, *95*, 664–669.
DOI:10.1016/j.saa.2012.04.074

- (14) **Single Stranded Helical Chains of C–H⋯π Interactions further Connected by Halogen–Halogen Interactions of Type I to Construct Supramolecular Structure of (*E*)-5-(Diethylamino)-2-[(4-iodophenylimino)methyl]phenol Compound**

Gökhan Kaştaş, Çiğdem Albayrak, Mustafa Odabaşoğlu*, René Frank, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* **2012**, *94*, 200–204.
DOI:10.1016/j.saa.2012.03.058.

- (13) **Synthesis and Thermolysis of the Phosphorus-Rich Manganese(I) Complex [Mn₂(μ-Br){*cyclo*-(P₄tBu₃)PtBu}(CO)₆]: From Complexes to Metal Phosphides**

Aslihan Kircali, René Frank, Santiago Gómez-Ruiz, Barbara Kirchner, Evamarie Hey-Hawkins*, *ChemPlusChem* **2012**, *77*(5), 341–344. DOI:10.1002/cplu.201200013.

- (12) **Electrophilic substitution of the *nido*-dicarbaborate anion 7,8-*nido*-C₂B₉H₁₂⁻ with sulfenyl chlorides**

René Frank, Toni Grell, Markus Hiller, Evamarie Hey-Hawkins*, *J. Chem. Soc., Dalton Trans.*, **2012**, 41, 6155–6161. DOI:10.1039/c2dt12501c.

- (11) **From *ortho*-carbaborane-9-thiol towards new building blocks**

René Frank, Solveig Boehnke, Almaz Aliev, Evamarie Hey-Hawkins*, *Polyhedron* **2012**, 39(1), 9–13. DOI:10.1016/j.poly.2012.03.003.

- (10) **Probing the Compound (*E*)-5-(Diethylamino)-2-[(4-methylphenylimino)methyl]phenol mainly from the Point of Tautomerism in Solvent Media and the Solid State by Experimental and Computational Methods**

Çiğdem Albayrak, Gökhan Kaştaş, Mustafa Odabaşoğlu*, René Frank, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* **2011**, 81(1), 72–78. DOI:10.1016/j.saa.2011.05.046.

- (9) **Pnicogen Bonds: A New Molecular Linker?**

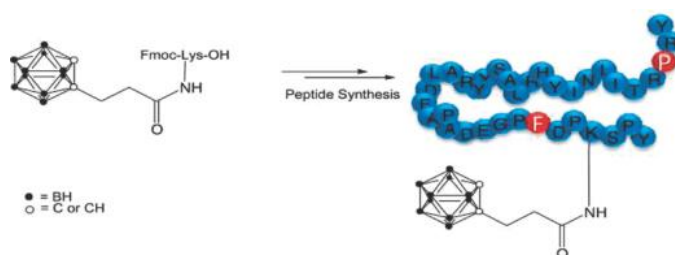
Stefan Zahn, René Frank, Evamarie Hey-Hawkins*, Barbara Kirchner*, *Chemistry - A European Journal* **2011**, 17(22), 6034–6038. DOI: 10.1002/chem.201002146.

- (8) **Anti-Leishmanial Activity of Homo- and Heteroleptic Bismuth(III) Carboxylates**

Philip C. Andrews*, René Frank, Peter C. Junk, Lukasz Kedzierski, Ish Kumar, Jonathan G. MacLellan, *Journal of Inorganic Biochemistry* **2011**, 105(3), 454–461. DOI:10.1016/j.jinorgbio.2010.08.007.

- (7) **Incorporation of *ortho*-Carbaboranyl-*N*_ε-Modified L-Lysine into Neuropeptide Y Receptor Y₁- and Y₂-Selective Analogues**

Verena M. Ahrens, René Frank, Sven Stadlbauer, Annette G. Beck-Sickinger*, Evamarie Hey-Hawkins*, *J. Med. Chem.* **2011**, 54 (7), 2368–2377. DOI:10.1021/jm101514m. Joint first authors.



- (6) **Making and Breaking of P–P Bonds with Low-Valent Transition-Metal Complexes**

Santiago Gómez-Ruiz, René Frank, Beatriz Gallego, Stefan Zahn, Barbara Kirchner*, Evamarie Hey-Hawkins*, *European Journal of Inorganic Chemistry* **2011**, 5, 739–747. DOI:10.1002/ejic.201001137.

- (5) **Spectroscopic, molecular structure characterizations and quantum chemical computational studies of (*E*)-5-(diethylamino)-2-[(2-fluorophenylimino)-methyl]-phenol**

Çiğdem Albayrak*, René Frank, *Journal of Molecular Structure* **2010**, 984(1–3), 214–220.
DOI:10.1016/j.molstruc.2010.09.030.

- (4) **Enantiomerically Pure Bis(phosphanyl)carbaborane(12) Compounds**

Sebastian Bauer, Steffen Tschirschwitz, Peter Lönnecke, René Frank, Barbara Kirchner, Matthew L. Clarke, Evamarie Hey-Hawkins, *European Journal of Inorganic Chemistry* **2009**, 19, 2776–2788. DOI:10.1002/ejic.200900304.

- (3) **Synthesis and Reactivity of *ortho*-Carbaborane-Containing Chiral Aminohalophosphines**

Sven Stadlbauer, René Frank, Ilham Maulana, Peter Lönnecke, Barbara Kirchner, Evamarie Hey-Hawkins, *Inorg. Chem.* **2009**, 48(13), 6072–6082.
DOI: 10.1021/ic900443c.

- (2) **Formation of Ho^{III} Trinuclear Clusters and Gd^{III} Monodimensional Polymers Induced by *ortho*- and *para*-Regioisomers of Pyridyl-Functionalised β -Diketones: Synthesis, Structure, and Magnetic Properties**

Philip C. Andrews, Glen B. Deacon, René Frank, Benjamin H. Fraser, Peter C. Junk, Jonathan G. MacLellan, Massimiliano Massi, Boujemaa Moubaraki, Keith S. Murray, Morry Silberstein, *European Journal of Inorganic Chemistry* **2009**, 6, 744–751.
DOI:10.1002/ejic.200801006.

- (1) **Epoxidation of Olefins Catalyzed by Novel Mn(III) and Mo(IV)-Salen Complexes Immobilized on Mesoporous Silica Gel: Part II: Study of the Catalytic Epoxidation of Olefins**

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