

## MIDA-protected Boronate Esters



*trans-2-bromovinylboronic acid MIDA ester,  
a highly versatile and useful surrogate boronic  
acid building block*

*Features include:*

MIDA as a Protecting Group  
and Iterative Cross-Coupling

Synthesis of Polyene Natural  
Products Using Polyene  
MIDA Boronates

Formation of Complex  
Boronic Acids from  
MIDA Boronates

## Introduction

The Suzuki-Miyaura cross-coupling reaction is one of the most important and highly utilized reactions in organic chemistry, with applications in polymer science as well as in the fine chemicals and pharmaceutical industries. However, some classes of boronic acids are exceptionally unstable and susceptible to decomposition which renders them inefficient in coupling reactions or makes long-term storage difficult. Additionally, performing iterative Suzuki Miyaura cross-couplings under mild conditions for the synthesis of small molecules is limited due to the reactivity of boronic acids and therefore a method to allow for iterative couplings under mild conditions has not been previously developed. The mechanism of transmetalation in Suzuki reactions may involve formation of an "ate" complex via interactions between the base and the vacant p orbital on the  $sp^2$  hybridized boron atom. Burke and coworkers predicted that a trivalent heteroatomic ligand, such as *N*-methyliminodiacetic acid (MIDA) (Figure 1) on the boron atom would rehybridize this center to  $sp^3$  and thereby attenuate transmetalation under cross-coupling conditions.

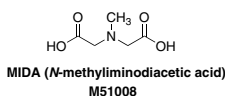


Figure 1

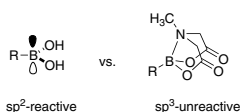


Figure 2

Release of the reactive,  $sp^2$ -hybridized boron-species under orthogonal mild conditions would enable this reactivity to be turned back on. In practice, it was discovered that the trivalent MIDA is very effective in this role.<sup>1</sup>  $sp^3$ -Hybridized MIDA boronates are unreactive towards transmetalation (see Figure 2 for comparison of  $sp^2$  and  $sp^3$ -hybridized boron species) and the ligand can be cleaved under mild conditions to liberate the corresponding boronic acid. This enables the execution of sequential Suzuki-Miyaura reactions under mild conditions.

The MIDA-protected boronate esters are easily handled, indefinitely bench-top stable under air, compatible with chromatography, and unreactive

under standard anhydrous cross-coupling conditions, even at temperatures up to 80 °C. However, deprotection is easily achieved at room temperature under mild aqueous basic conditions using either 1M NaOH, or even  $NaHCO_3$ .

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## Reference:

(1) Gillis, E. P.; Burke, M. D. *J. Am. Chem. Soc.* **2007**, *129*, 6716.

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## About Our Cover

The image on the cover represents the three-dimensional structure of *trans*-2-bromovinylboronic acid MIDA ester. The bromine atom is represented in purple. This B-protected haloboronic acid is representative of many powerful new reagents for iterative cross-coupling.

Josephine Nakhla  
Product Manager

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## MIDA as a Protecting Group and Iterative Cross-Coupling

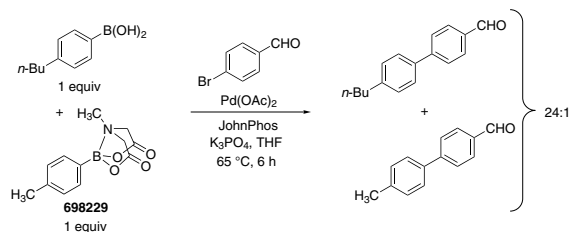
To demonstrate the efficacy of MIDA as a protecting group, Burke's group reacted a 1:1 mixture of the MIDA boronate **698229** and 4-butylphenylboronic acid with 4-bromobenzaldehyde under Buchwald's anhydrous Suzuki-Miyaura conditions (**Scheme 1**). The resultant product mixture displayed a 24:1 preference for reaction with the unprotected boronic acid. A control experiment using *p*-tolyl boronic acid in lieu of **698229** provided a 1:1 mixture of the two products. Additionally, when a control reaction employing the *N*-methyl-diethanolamine adduct instead of the *N*-methyliminodiacetic acid was performed, no selectivity was observed, presumably due to the increased flexibility of the *N*-methyl-diethanolamine derivative.

Various halo-containing MIDA-derivatives were prepared, cross-coupled with boronic acids, and sequentially deprotected under basic conditions to release the unprotected boronic acid, thereby demonstrating the utility towards iterative cross-coupling (**Scheme 2**).

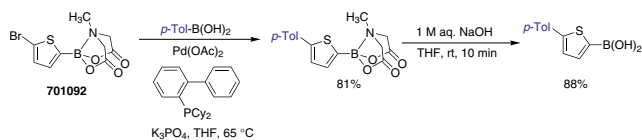
The potential for iterative cross-couplings using the Burke methodology was further demonstrated in their total synthesis of ratanahine (**Scheme 3**). *trans*-1-Propen-1-ylboronic acid was coupled with the benzofuran-yl MIDA boronate **1**, which was deprotected and cross-coupled with the bulky aryl bromide MIDA boronate **2** at elevated temperature. The subsequent intermediate was deprotected and coupled with vinyl bromide **3** to yield the diMOM ether. Cleavage of the two MOM groups resulted in ratanahine, in seven steps in the longest linear sequence. Enabling features of this type of synthesis include the use of only a single, mild reaction to assemble a collection of easily synthesized, readily purified, and highly robust building blocks. Moreover, the short and modular nature of this pathway enables the easy preparation of analogs simply by substituting modified building blocks into the same iterative cross-coupling sequence.<sup>1</sup>

### Reference:

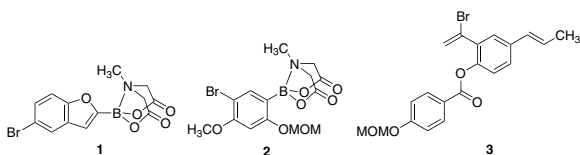
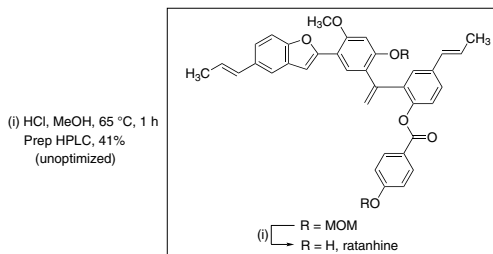
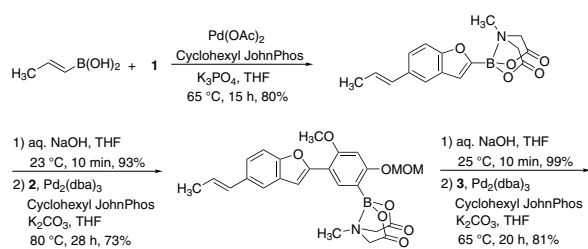
(1) Gillis, E. P.; Burke, M. D. *J. Am. Chem. Soc.* **2007**, *129*, 6716.



**Scheme 1**



**Scheme 2**



**Scheme 3**

## Synthesis of Polyene Natural Products Using Polyene MIDA Boronates

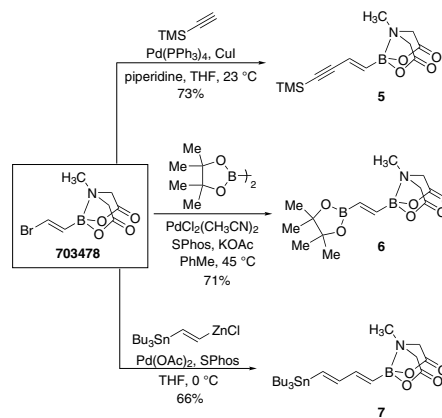
Palladium-catalyzed cross-coupling reactions are ideal methods for the synthesis of polyenes because of the stereospecificity of the reactions and the mildness of the reaction conditions. However, polyenylboronic acids are very unstable and therefore difficult to employ in the synthesis of polyenes via Suzuki reactions. In another exemplary demonstration of the MIDA boronates' stability and efficiency in iterative cross-coupling, Burke and coworkers utilized a common alkenyl MIDA boronate (**703478**) to create a series of polyenyl building blocks. The MIDA boronate terminus is inert to Heck, Stille, and Suzuki couplings, yielding butadienyl MIDA boronates (**Scheme 4**).

The alkenyl MIDA boronate **703478** was also applied to the synthesis of the carotenoid *all-trans*-retinal. Demonstrating the feasibility of polyenyl MIDA boronates in synthesis, boron deprotection of the intermediate **4** proceeded smoothly to generate the boronic acid, which was subsequently coupled with the  $\beta$ -bromo enal to provide *all-trans*-retinal (**Scheme 5**).

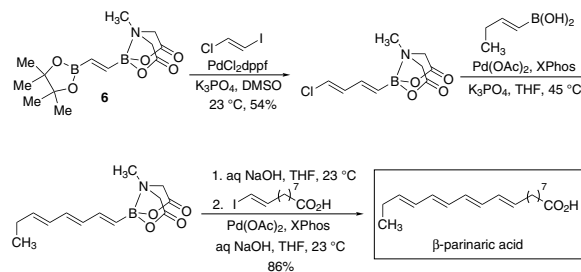
Miyaura borylation (**Scheme 6**, to provide **6**) and Sonogashira and Negishi couplings (to provide **5** and **7**, respectively) that yield bis-metalated lynchpin-type reagents were also demonstrated. Synthetic reagent **6** was further elaborated in the polyene natural product synthesis of  $\beta$ -parinaric acid (**Scheme 7**) and reagent **7** was employed in the preparation of the polyene chain of amphotericin B (**Scheme 8**).<sup>2</sup>

### Reference:

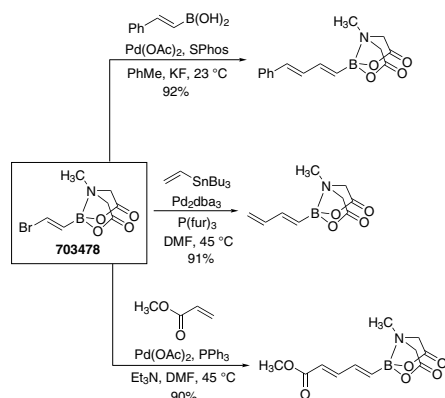
(2) Lee, S. J.; Gray, K. C.; Paek, J. S.; Burke, M. D. *J. Am. Chem. Soc.* **2008**, *130*, 466.



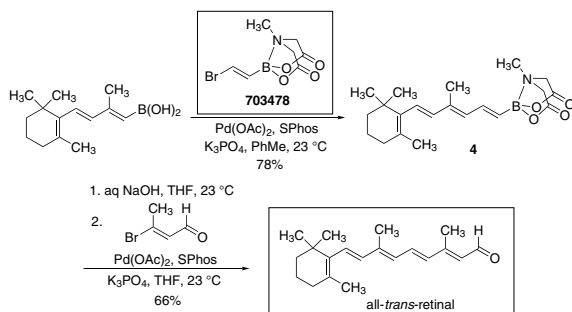
Scheme 6



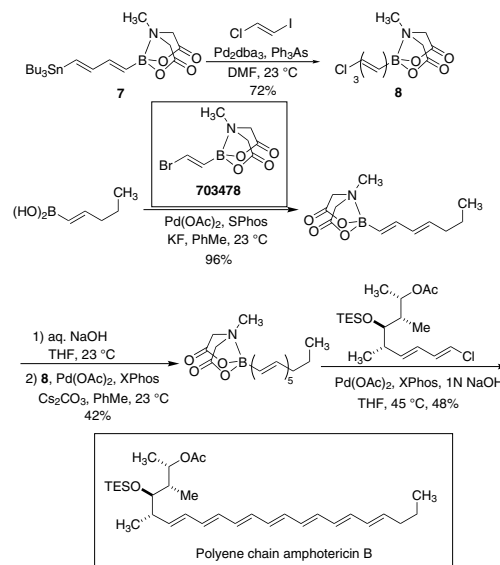
Scheme 7



Scheme 4



Scheme 5



Scheme 8

## Formation of Complex Boronic Acids from MIDA Boronates

Another extremely useful feature of the MIDA boronates is their compatibility with a wide range of common synthetic reagents, allowing for the elaboration of functionalized MIDA boronates to create structurally complex boronic acid surrogates. This was recently demonstrated by Burke and coworkers with the transformation of the 4-(hydroxymethyl)phenyl MIDA boronate **698105** by a variety of common oxidants and other reagents to create an array of synthetically useful MIDA boronates (Scheme 9). Even harsh reagents such as triflic acid, and Jones oxidant were well tolerated, and the MIDA boronate was left intact. In several cases, transformations can be easily reversed to yield the original 4-(hydroxymethyl)phenyl MIDA boronate.

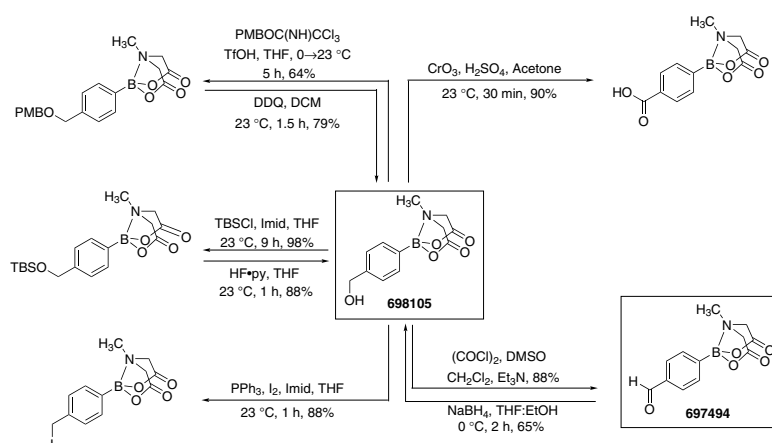
The 4-formylphenyl MIDA boronate **697494** was further elaborated in various C-C bond-forming reactions. The results show that MIDA

boronates are also compatible with Evans aldol, Horner-Wadsworth-Emmons olefination, and Takai olefination protocols. Reductive amination is also well-tolerated (Scheme 10).

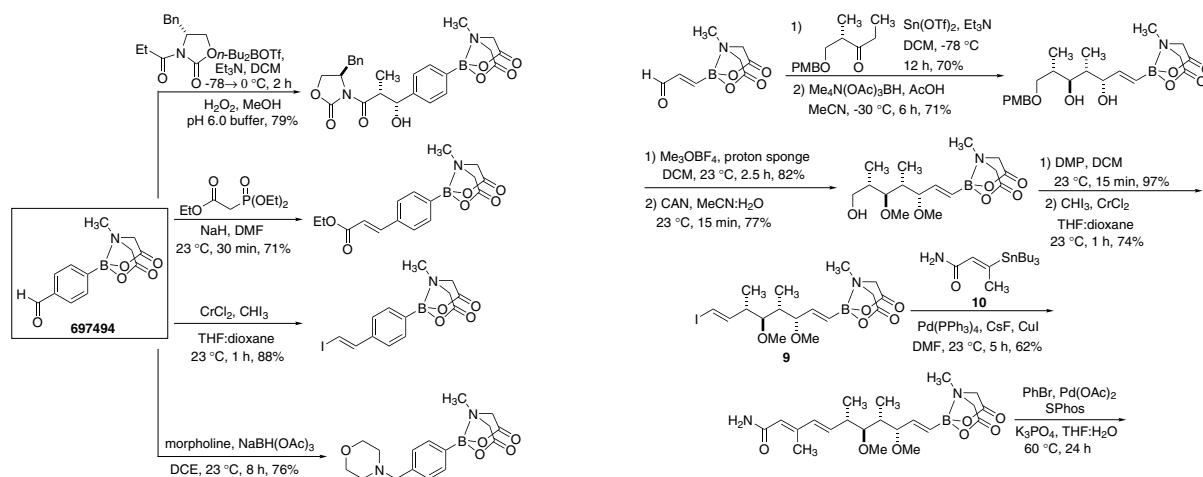
The impact of the exceptional compatibility of the MIDA boronate was exhibited in the total synthesis of (+)-crocin C starting from an acrolein MIDA boronate (Scheme 11). The MIDA boronate tolerated a Paterson aldol and diastereoselective reduction protocol to yield the diol MIDA boronate, which was purified by silica gel chromatography. The purified MIDA boronate was permethylated with Meerwein's salt, deprotected with CAN, oxidized with Dess-Martin periodinane and subjected to Takai olefination to yield the stable, crystalline, complex MIDA boronate **9**. Stille coupling of **9** with known building block **10**, followed by in situ boronic acid release and cross-coupling with bromobenzene provided (+)-crocin C.<sup>3</sup>

### Reference:

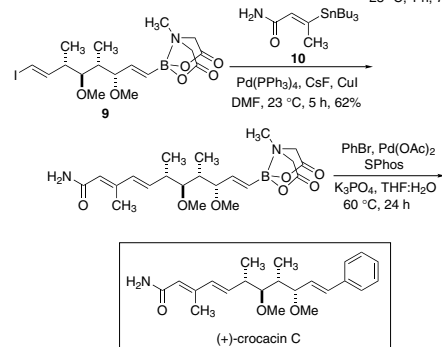
(3) Gillis, E. P.; Burke, M. D. *J. Am. Chem. Soc.* **2008**, *130*, 14084.



Scheme 9



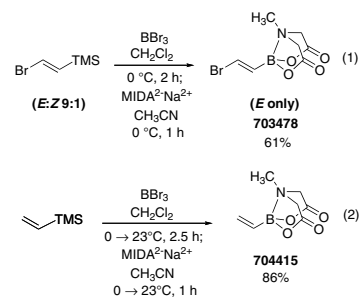
Scheme 10



Scheme 11

## Preparation of *trans*-(2-bromovinyl) MIDA Boronate and Vinyl MIDA Boronate from the Corresponding Silanes

Due to the instability of some boronic acids, the Burke group has developed very practical syntheses of some of the more challenging MIDA boronates. For instance, while *trans*-(2-bromovinyl) MIDA boronate (**703478**) could be prepared via bromoboration of acetylene and reaction with MIDA in the presence of base, a more convenient procedure was subsequently developed. The synthesis of *trans*-(2-bromovinyl) MIDA boronate is achieved via transmetalation of 1-bromo-2-trimethylsilyl ethylene with  $\text{BBr}_3$ , followed by trapping with  $\text{MIDA}^2\text{Na}^{2+}$  to form the MIDA boronate (**Scheme 12**-(1)). This procedure also gave rise to the very useful building block, vinyl MIDA boronate (**704415**) (**Scheme 12**-(2)). Of note, the corresponding boronic acid is very unstable.<sup>4</sup>



Scheme 12

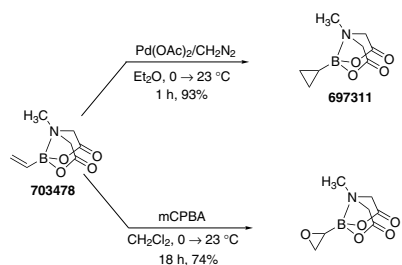
## Synthetic Utility of Vinyl MIDA Boronate

The utility of vinyl MIDA boronate was demonstrated via cyclopropanation and epoxidation to the corresponding MIDA cyclopropane and oxirane, respectively. These procedures (**Scheme 13**) provided air and chromatography-stable solids in both cases, with the oxirane being the first known synthesis of an unsubstituted oxiranylborane (confirmed by X-ray analysis of the oxiranylborane).

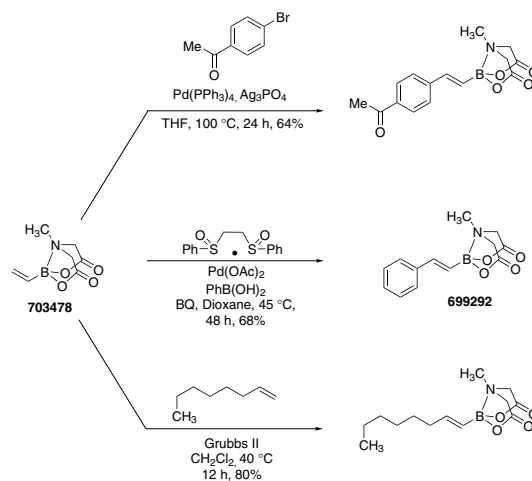
Vinyl MIDA boronate was also successfully subjected to Heck and oxidative Heck reactions as well as to olefin metathesis (**Scheme 14**) to provide the desired alkenyl MIDA boronates. The cross metathesis of vinyl MIDA boronate with various olefins represents a potent strategy for the highly stereoselective construction of substituted vinyl boranes. This method proved successful in the preparation of a variety of disubstituted olefins (**Scheme 15**) with excellent yields (81-98%) and *E:Z* selectivities (>20:1). This procedure represents a significant advance relative to the cross metathesis with alkenyl pinacol, which can be limited by instability of the alkenyl boronic ester substrates, the stereoselectivity of the transformation, and/or the ease of purification of the resulting products.<sup>4</sup>

### Reference:

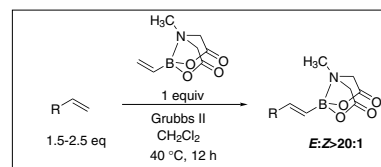
(4) Uno, B. E.; Gillis, E. P.; Burke, M. D. *Tetrahedron* **2008**, *In Press*.



Scheme 13



Scheme 14



Entry	Cross partner	Cross product	Isolated yield (%)
1	<i>i</i> -Pr <sub>3</sub> Si-CH=CH <sub>2</sub>	<i>i</i> -Pr <sub>3</sub> Si-CH=CH-B(OAc) <sub>2</sub> -MIDA	85
2	AcO-CH=CH-OAc	AcO-CH=CH-B(OAc) <sub>2</sub> -MIDA	84
3	Cyclohexyl-CH=CH <sub>2</sub>	Cyclohexyl-CH=CH-B(OAc) <sub>2</sub> -MIDA ( <b>703710</b> )	96
4	HO-C(CH <sub>3</sub> ) <sub>2</sub> -CH=CH <sub>2</sub>	HO-C(CH <sub>3</sub> ) <sub>2</sub> -CH=CH-B(OAc) <sub>2</sub> -MIDA	94
5	Br-Ph-CH=CH <sub>2</sub>	Br-Ph-CH=CH-B(OAc) <sub>2</sub> -MIDA	<i>ortho</i> 81 <i>meta</i> 91 <i>para</i> 89

Scheme 15

## MIDA Ligand

### Methyliminodiacetic acid, 99%

[4408-64-4]

Beil. 4,367

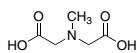
C<sub>5</sub>H<sub>9</sub>NO<sub>4</sub>

FW 147.13

mp.....220 °C (dec.)

M51008-5G 5 g

M51008-25G 25 g



## Alkyl MIDA Boronates

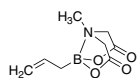
### Allylboronic acid MIDA ester

2-Allyl-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione

C<sub>8</sub>H<sub>12</sub>BNO<sub>4</sub>

FW 197.00

698709-1G 1 g



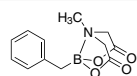
### Benzylboronic acid MIDA ester, 95%

C<sub>12</sub>H<sub>14</sub>BNO<sub>4</sub>

FW 247.05

701114-1G 1 g

701114-5G 5 g



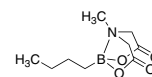
### n-Butylboronic acid MIDA ester

C<sub>9</sub>H<sub>16</sub>BNO<sub>4</sub>

FW 213.04

701580-1G 1 g

701580-5G 5 g

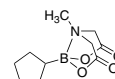


### Cyclopentylboronic acid MIDA ester, 97%

C<sub>10</sub>H<sub>16</sub>BNO<sub>4</sub>

FW 225.05

699144-1G 1 g



### Cyclopropylboronic acid MIDA ester, 97%

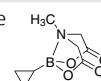
Cyclopropylboronic acid methyliminodiacetic acid anhydride

C<sub>8</sub>H<sub>12</sub>BNO<sub>4</sub>

FW 197.00

697311-1G 1 g

697311-5G 5 g



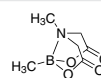
### Methylboronic acid MIDA ester, 97%

C<sub>6</sub>H<sub>10</sub>BNO<sub>4</sub>

FW 170.96

700657-1G 1 g

700657-5G 5 g



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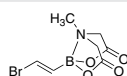
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## Alkenyl MIDA Boronates

**trans-2-Bromovinylboronic acid MIDA ester** NEW

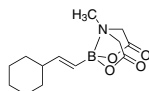
BB1  
 $C_7H_9BBrNO_4$   
 FW 261.87



703478-500MG 500 mg  
 703478-1G 1 g

**trans-(2-Cyclohexylvinyl)boronic acid MIDA ester, 95%** NEW

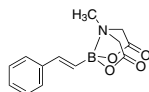
$C_{13}H_{20}BNO_4$   
 FW 265.11



703710-1G 1 g

**trans-2-Phenylvinylboronic acid MIDA ester, 95%** NEW

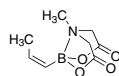
$C_{13}H_{14}BNO_4$   
 FW 259.07



699292-1G 1 g

**cis-1-Propenylboronic acid MIDA ester** NEW

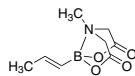
*cis*-1-Propene-1-boronic acid MIDA ester; *cis*-6-Methyl-2-(1-propenyl)-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_8H_{12}BNO_4$   
 FW 197.00



698199-1G 1 g

**trans-1-Propenylboronic acid MIDA ester** NEW

$C_8H_{12}BNO_4$   
 FW 197.00

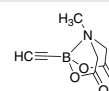


701831-1G 1 g

## Alkynyl MIDA Boronates

**Ethynylboronic acid MIDA ester** NEW

Acetyleneboronic acid MIDA ester; Ethyneboronic acid MIDA ester; Acetynylboronic acid MIDA ester  
 $C_7H_8BNO_4$   
 FW 180.95

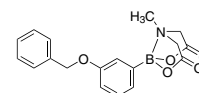


700231-1G 1 g

## Aryl MIDA Boronates

**3-Benzyloxyphenylboronic acid MIDA ester, 96%** NEW

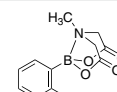
$C_{18}H_{18}BNO_5$   
 FW 339.15



699861-1G 1 g

**2-Bromophenylboronic acid MIDA ester, 95%** NEW

2-(2-Bromophenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BBrNO_4$   
 FW 311.92

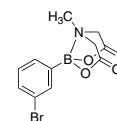


698040-1G 1 g

698040-5G 5 g

**3-Bromophenylboronic acid MIDA ester, 96%** NEW

2-(3-Bromophenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BBrNO_4$   
 FW 311.92



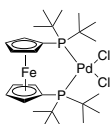
698113-1G 1 g

698113-5G 5 g

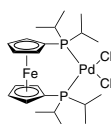
## New Palladium Catalysts for Cross-Coupling from Sigma-Aldrich®



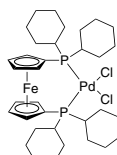
Cross-coupling has been a cornerstone set of reactions for the formation of carbon-carbon bonds. For the past twenty years, numerous research groups have developed new metal complexes and ligands, expanding the scope of these transformations to give access to more complex molecules. Among these important reactions, several stand out, such as Suzuki, Negishi, Heck, Kumada, Stille, Sonogashira and Buchwald Hartwig amination reactions. Furthermore, scientists have developed new complexes, usually palladium based, that are able to catalyze the aforementioned reactions, with high yields and low catalyst loadings. Sigma-Aldrich is happy to offer new palladium catalysts for cross-coupling reactions.



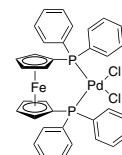
701602



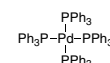
702005



701998



697230



High Purity 99.9+%  
 697265

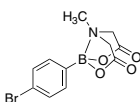
[sigma-aldrich.com](http://sigma-aldrich.com)

**SIGMA-ALDRICH®**



**4-Bromophenylboronic acid MIDA ester, 97%** NEW

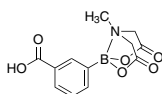
2-(4-Bromophenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BBrNO_4$   
 FW 311.92



698083-1G 1 g  
 698083-5G 5 g

**3-Carboxyphenylboronic acid MIDA ester, 96%** NEW

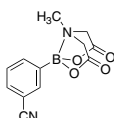
3-(6-Methyl-4,8-dioxo-1,3,6,2-dioxazaborocan-2-yl)benzoic acid  
 $C_{12}H_{12}BNO_6$   
 FW 277.04



698091-1G 1 g

**3-Cyanophenylboronic acid MIDA ester, 97%** NEW

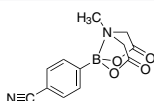
3-(6-Methyl-4,8-dioxo-1,3,6,2-dioxazaborocan-2-yl)benzotrile  
 $C_{12}H_{11}BN_2O_4$   
 FW 258.04



698024-1G 1 g  
 698024-5G 5 g

**4-Cyanophenylboronic acid MIDA ester, 97%** NEW

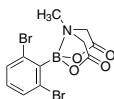
4-(6-Methyl-4,8-dioxo-1,3,6,2-dioxazaborocan-2-yl)benzotrile  
 $C_{12}H_{11}BN_2O_4$   
 FW 258.04



697990-1G 1 g  
 697990-5G 5 g

**2,6-Dibromophenylboronic acid MIDA ester** NEW

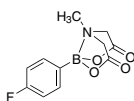
$C_{11}H_{10}BBr_2NO_4$   
 FW 390.82



703044-500MG 500 mg  
 703044-1G 1 g

**4-Fluorophenylboronic acid MIDA ester, 97%** NEW

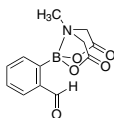
2-(4-Fluorophenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BFNO_4$   
 FW 251.02



701548-5G 5 g

**2-Formylphenylboronic acid MIDA ester, 97%** NEW

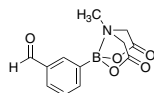
2-(6-Methyl-4,8-dioxo-1,3,6,2-dioxazaborocan-2-yl)benzaldehyde  
 $C_{12}H_{12}BNO_5$   
 FW 261.04



698210-1G 1 g  
 698210-5G 5 g

**3-Formylphenylboronic acid MIDA ester, 97%** NEW

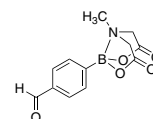
3-(6-Methyl-4,8-dioxo-1,3,6,2-dioxazaborocan-2-yl)benzaldehyde  
 $C_{12}H_{12}BNO_5$   
 FW 261.04



700932-1G 1 g  
 700932-5G 5 g

**4-Formylphenylboronic acid MIDA ester, 96%** NEW

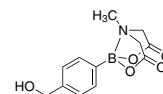
4-Formylphenylboronic acid methyliminoacetic acid anhydride  
 $C_{12}H_{12}BNO_5$   
 FW 261.04



697494-1G 1 g

**4-(Hydroxymethyl)phenylboronic acid MIDA ester** NEW

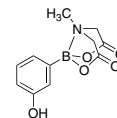
2-(4-(Hydroxymethyl)phenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{12}H_{14}BNO_5$   
 FW 263.05



698105-1G 1 g

**3-Hydroxyphenylboronic acid MIDA ester, 97%** NEW

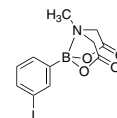
2-(3-Hydroxyphenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{12}BNO_5$   
 FW 249.03



698008-5G 5 g

**3-Iodophenylboronic acid MIDA ester, 97%** NEW

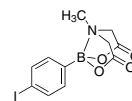
2-(3-Iodophenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BI NO_4$   
 FW 358.92



698156-1G 1 g

**4-Iodophenylboronic acid MIDA ester, 97%** NEW

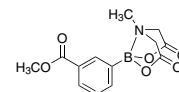
2-(4-Iodophenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BI NO_4$   
 FW 358.92



698121-1G 1 g  
 698121-5G 5 g

**3-Methoxycarbonylphenylboronic acid MIDA ester, 97%** NEW

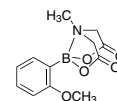
Methyl 3-(6-methyl-4,8-dioxo-1,3,6,2-dioxazaborocan-2-yl)benzoate  
 $C_{13}H_{14}BNO_6$   
 FW 291.06



698164-1G 1 g  
 698164-5G 5 g

**2-Methoxyphenylboronic acid MIDA ester, 97%** NEW

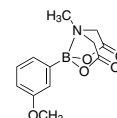
2-(2-Methoxyphenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{12}H_{14}BNO_5$   
 FW 263.05



698075-1G 1 g

**3-Methoxyphenylboronic acid MIDA ester, 97%** NEW

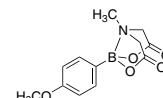
$C_{12}H_{14}BNO_5$   
 FW 263.05



699160-1G 1 g  
 699160-5G 5 g

**4-Methoxyphenylboronic acid MIDA ester, 97%** NEW

2-(4-Methoxyphenyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{12}H_{14}BNO_5$   
 FW 263.05

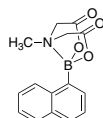


700924-1G 1 g  
 700924-5G 5 g

**1-Naphthylboronic acid MIDA ester, 95%**

NEW

Naphthalene-1-boronic acid MIDA ester  
 $C_{15}H_{14}BNO_4$   
 FW 283.09



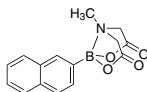
699136-1G

1 g

**2-Naphthylboronic acid MIDA ester, 95%**

NEW

$C_{15}H_{14}BNO_4$   
 FW 283.09



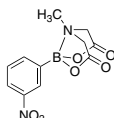
699853-1G

1 g

**3-Nitrophenylboronic acid MIDA ester, 97%**

NEW

6-Methyl-2-(3-nitrophenyl)-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{11}BN_2O_6$   
 FW 278.03



698148-1G

1 g

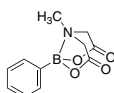
698148-5G

5 g

**Phenylboronic acid MIDA ester, 95%**

NEW

6-Methyl-2-phenyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{13}BNO_4$   
 FW 233.03



698032-1G

1 g

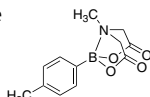
698032-5G

5 g

**4-Tolylboronic acid MIDA ester, 97%**

NEW

6-Methyl-2-*p*-tolyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{12}H_{14}BNO_4$   
 FW 247.05



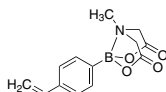
698229-5G

5 g

**4-Vinylphenylboronic acid MIDA ester, 97%**

NEW

6-Methyl-2-(4-vinylphenyl)-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{13}H_{14}BNO_4$   
 FW 259.07



701890-500MG

500 mg

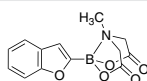
701890-1G

1 g

**Heteroaryl MIDA Boronates****2-Benzofuranylboronic acid MIDA ester, 97%**

NEW

2-Benzofuranboronic acid MIDA ester; 2-(Benzofuran-2-yl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{13}H_{12}BNO_5$   
 FW 273.05



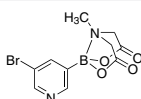
701106-1G

1 g

**5-Bromo-3-pyridinylboronic acid MIDA ester, 95%**

NEW

5-Bromopyridine-3-boronic acid MIDA ester  
 $C_{10}H_{10}BBrN_2O_4$   
 FW 312.91



703370-1G

1 g

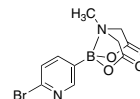
703370-5G

5 g

**6-Bromo-3-pyridinylboronic acid MIDA ester, 97%**

NEW

2-Bromopyridine-5-boronic acid MIDA ester;  
 2-(6-Bromo-3-pyridinyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione; 6-Bromopyridine-3-boronic acid MIDA ester  
 $C_{10}H_{10}BBrN_2O_4$   
 FW 312.91



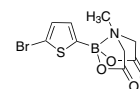
702269-1G

1 g

**5-Bromo-2-thiophenylboronic acid MIDA ester, 95%**

NEW

5-Bromothiophene-2-boronic acid MIDA ester;  
 2-(5-Bromothiophen-2-yl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_9H_9BBrNO_4S$   
 FW 317.95



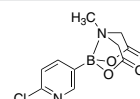
701092-1G

1 g

**6-Chloro-3-pyridinylboronic acid MIDA ester, 97%**

NEW

6-Chloro-3-pyridineboronic acid MIDA ester;  
 2-(6-Chloro-3-pyridinyl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione; 2-Chloropyridine-5-boronic acid MIDA ester  
 $C_{10}H_{10}BClN_2O_4$   
 FW 268.46



mp..... 222 to 226 °C

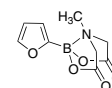
700908-1G

1 g

**2-Furanylboronic acid MIDA ester, 97%**

NEW

2-Furanboronic acid MIDA ester; 2-(Furan-2-yl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_9H_{10}BNO_5$   
 FW 222.99



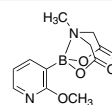
701017-1G

1 g

**2-Methoxy-3-pyridinylboronic acid MIDA ester, 97%**

NEW

2-Methoxy-3-pyridineboronic acid MIDA ester;  
 2-(2-Methoxypyridin-3-yl)-6-methyl-1,3,6,2-dioxazaborocane-4,8-dione  
 $C_{11}H_{13}BN_2O_5$   
 FW 264.04



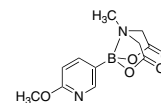
701084-1G

1 g

**2-Methoxy-5-pyridinylboronic acid MIDA ester, 97%**

NEW

2-Methoxy-5-pyridineboronic acid MIDA ester  
 $C_{11}H_{13}BN_2O_5$   
 FW 264.04



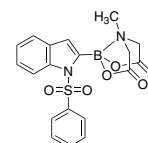
699845-1G

1 g

**1-(Phenylsulfonyl)-2-indolylboronic acid MIDA ester, 96%**

NEW

1-(Phenylsulfonyl)indole-2-boronic acid MIDA ester;  
 1-(Phenylsulfonyl)indole-2-boronic acid;  
 Methyliminodiacetic acid anhydride  
 $C_{19}H_{17}BN_2O_6S$   
 FW 412.22



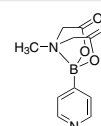
697443-1G

1 g

**4-Pyridinylboronic acid MIDA ester, 95%**

NEW

4-Pyridineboronic acid MIDA ester  
 $C_{10}H_{11}BN_2O_4$   
 FW 234.02



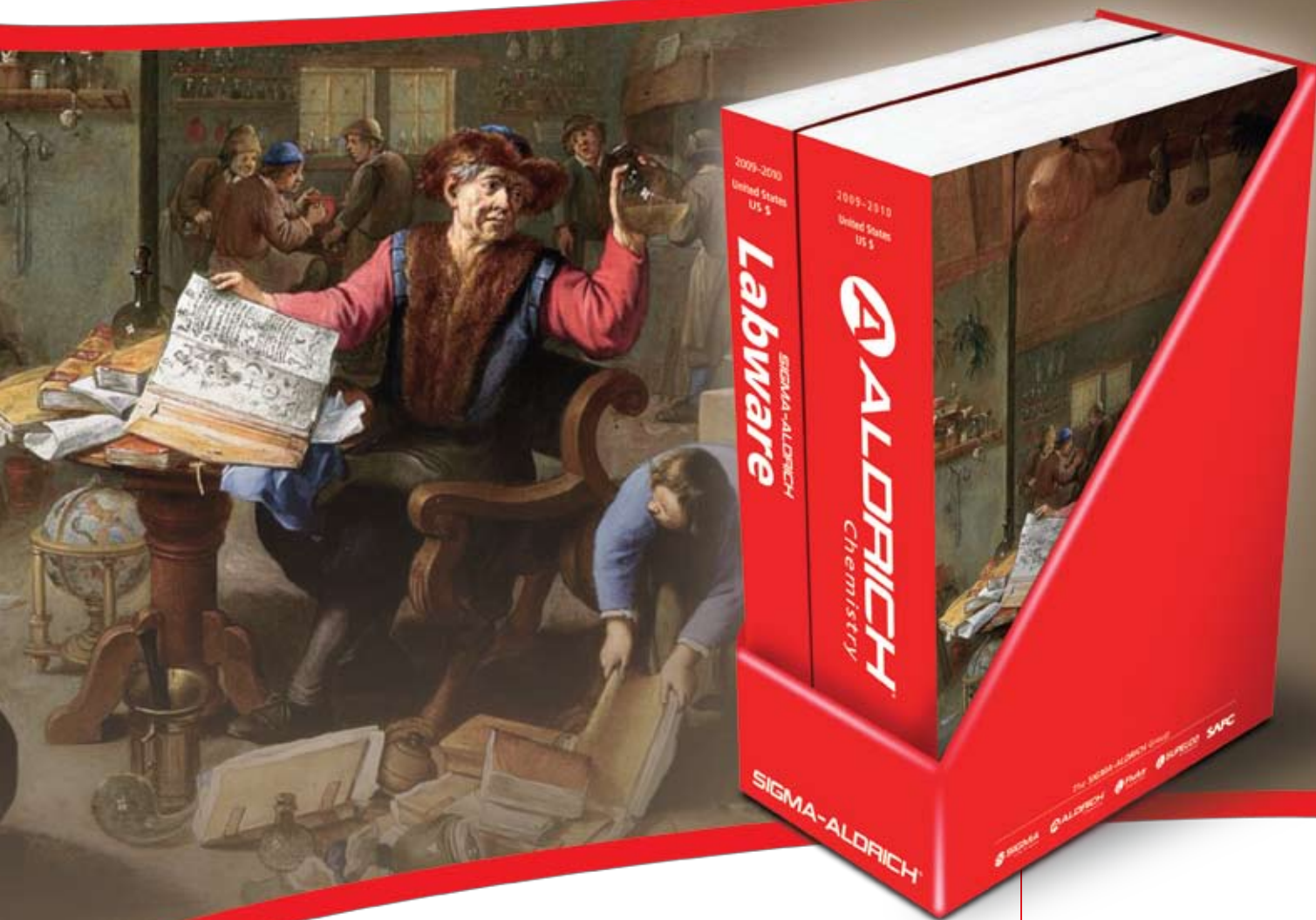
699179-1G

1 g

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SIGMA-ALDRICH S.r.l.  
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Tel: (+81) 3 5796 7300  
Fax: (+81) 3 5796 7315

#### Korea

SIGMA-ALDRICH KOREA  
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#### Malaysia

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Fax: (+31) 78 620 5421

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#### Norway

SIGMA-ALDRICH NORWAY AS  
Tel: (+47) 23 17 60 60  
Fax: (+47) 23 17 60 50

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Tel: (+48) 61 829 01 00  
Fax: (+48) 61 829 01 20

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SIGMA-ALDRICH QUÍMICA, S.A.  
Free Tel: 800 202 180  
Free Fax: 800 202 178  
Tel: (+351) 21 924 2555  
Fax: (+351) 21 924 2610

#### Russia

SIGMA-ALDRICH RUS, LLC  
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+7 (495) 621 5828  
Fax: +7 (495) 621 5923

#### Singapore

SIGMA-ALDRICH PTE. LTD.  
Tel: (+65) 6779 1200  
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Tel: (+421) 255 571 562  
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SIGMA-ALDRICH QUÍMICA, S.A.  
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Free Fax: 900 102 028  
Tel: (+34) 91 661 99 77  
Fax: (+34) 91 661 96 42

#### Sweden

SIGMA-ALDRICH SWEDEN AB  
Tel: (+46) 8 742 4200  
Fax: (+46) 8 742 4243

#### Switzerland

SIGMA-ALDRICH CHEMIE GmbH  
Free Tel: 0800 80 00 80  
Free Fax: 0800 80 00 81  
Tel: (+41) 81 755 2828  
Fax: (+41) 81 755 2815

#### United Kingdom

SIGMA-ALDRICH COMPANY LTD.  
Free Tel: 0800 717 181  
Free Fax: 0800 378 785  
Tel: (+44) 1747 833 000  
Fax: (+44) 1747 833 313  
SAFC (UK) Tel: 01202 712305

#### United States

SIGMA-ALDRICH  
P.O. Box 14508  
St. Louis, Missouri 63178  
Toll-Free: 800 325 3010  
Toll-Free Fax: 800 325 5052  
Call Collect: (+1) 314 771 5750  
Tel: (+1) 314 771 5765  
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#### World Headquarters

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