**P:ANN/加州理工学院 AND DB/US and g/cite-d and ann/浙江大学 and g/ref-s and ann/加州理工学院**

Patentics专利检索分析报告

**patentics.com**

**ENZYMATIC METHODS FOR NITROGEN-ATOM TRANSFER**

**公开号:** [US20160040199](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=160040199&sv=322d1266265999cd8c7ae193ae718839) **申请号:** 14/792,451

**申请日:** 2015/07/06 **公开日:** 2016/02/11

**申请人:** 加州理工学院

**发明人:** HYSTER; TODD K.

**摘要**

The present invention provides methods for catalyzing a nitrene insertion into a C—H bond to produce a product having a new C—N bond, comprising providing a C—H containing substrate, a nitrene precursor and an engineered heme enzyme; and allowing the reaction to proceed for a time sufficient to form a regioselective product having a new C—N bond.

**主权项** 专利度: 20 特征度: 6

A method for catalyzing a nitrene insertion into a C—H bond to produce a regioselective product having a new C—N bond, the method comprising:

providing a C—H containing substrate, a nitrene precursor and an engineered heme enzyme; and

allowing the reaction to proceed for a time sufficient to form a regioselective product having a new C—N bond.

**引用/自引用/引用公司数:** 58/0/36

**IN VIVO AND IN VITRO OLEFIN CYCLOPROPANATION CATALYZED BY HEME ENZYMES**

**公开号:** [US20160002682](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=160002682&sv=d6b3b7519c23466e6d07cf215ea0bf03) **申请号:** 14/625,449

**申请日:** 2015/02/18 **公开日:** 2016/01/07

**申请人:** 加州理工学院

**发明人:** COELHO; PEDRO S.|Brustad; Eric M.|Arnold; Frances H.|Wang; Zhan|Lewis; Jared C.

**摘要**

The present invention provides methods for catalyzing the conversion of an olefin to any compound containing one or more cyclopropane functional groups using heme enzymes. In certain aspects, the present invention provides a method for producing a cyclopropanation product comprising providing an olefinic substrate, a diazo reagent, and a heme enzyme; and admixing the components in a reaction for a time sufficient to produce a cyclopropanation product. In other aspects, the present invention provides heme enzymes including variants and fragments thereof that are capable of carrying out in vivo and in vitro olefin cyclopropanation reactions. Expression vectors and host cells expressing the heme enzymes are also provided by the present invention.

**主权项** 专利度: 20 特征度: 12

1-82. (canceled)

**引用/自引用/引用公司数:** 58/0/36

**IN VIVO AND IN VITRO CARBENE INSERTION AND NITRENE TRANSFER REACTIONS CATALYZED BY HEME ENZYMES**

**公开号:** [US20150267232](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=150267232&sv=dd8b31ede4232f3b1d255c3744c2fe76) **申请号:** 14/676,744

**优先权日:** 2013/06/21 **申请日:** 2015/04/01 **公开日:** 2015/09/24

**申请人:** 加州理工学院

**发明人:** COELHO; PEDRO|Arnold; Frances H.|Lewis; Jared C.|Wang; Zhan

**摘要**

This invention relates to the use of heme-containing enzymes to catalyze carbene and nitrene insertion and transfer reactions with greater selectivity, mild reaction conditions, and convenient production.

**主权项** 专利度: 35 特征度: 6

A method for catalyzing a carbene insertion into a N—H bond to produce a product having a new C—N bond, the method comprising:

providing a N—H containing substrate, a diazo carbene precursor and an engineered heme enzyme; and

allowing the reaction to proceed for a time sufficient to form a product having a new C—N bond.

**引用/自引用/引用公司数:** 58/0/36

**同族** 6

**METHODS AND SYSTEMS FOR SULFIMIDATION OR SULFOXIMIDATION OF ORGANIC MOLECULES**

**公开号:** [US20150232814](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=150232814&sv=c85551830e2ab99e4c21cc74f2caeb8b) **申请号:** 14/625,514

**申请日:** 2015/02/18 **公开日:** 2015/08/20

**申请人:** 加州理工学院

**发明人:** Farwell; Christopher C.|McIntosh; John A.|Arnold; Frances H.

**摘要**

The disclosure generally relates to the fields of synthetic organic chemistry. In particular, the present disclosure relates to methods and systems for the imidation of sulfides.

**主权项** 专利度: 57 特征度: 7

A method for catalyzing the intermolecular insertion of nitrogen into organosulfur substrates to produce a product having a new S—N bond, the method comprising:

providing a nitrene source, an organosulfur substrate and a heme enzymes or an engineered heme enzyme; and

allowing the reaction to proceed for a time sufficient to form a product having a new S—N bond.

**法律描述**

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: CONFIRMATORY LICENSE (SEE DOCUMENT FOR DETAILS).

Patent Assignor: CALIFORNIA INSTITUTE OF TECHNOLOGY (date: 20150309)

Correspondent: DIRECTOR, DEITR, NIH, 6705 ROCKLEDGE DRIVE, SUITE 310, MSC 7980, BETHESDA, MD 20892-7980

Patent Assignee: NATIONAL INSTITUTES OF HEALTH (NIH), U.S. DEPT. OF HEALTH AND HUMAN SERVICES (DHHS), U.S. GOVERNMENT (address: NIH DIVISION OF EXTRAMURAL INVENTIONS AND TECHNOLOGY RESOURCES (DEITR), 6705 ROCKLEDGE DRIVE, SUITE 310, MSC 7980, BETHESDA, MARYLAND, 20892-7980)

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: FARWELL, CHRISTOPHER C. (date: 20150113)

Patent Assignor: MCINTOSH, JOHN A. (date: 20150113)

Patent Assignor: ARNOLD, FRANCES H. (date: 20150116)

Correspondent: JOSEPH R. BAKER, JR., 4660 LA JOLLA VILLAGE DRIVE, SUITE 750, SAN DIEGO, CA 92122

Patent Assignee: THE CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 EAST CALIFORNIA BLVD., MC 6-32, PASADENA, CALIFORNIA, 91125)

**引用/自引用/引用公司数:** 63/0/39

**In vivo and in vitro olefin cyclopropanation catalyzed by heme enzymes**

**授权号:** [US8993262](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=8993262&sv=9253577ad2d301e0b85c23579d4ca766) **申请号:** 14/185,861

**优先权日:** 2013/07/19 **申请日:** 2014/02/20 **授权日:** 2015/03/31

**申请人:** 加州理工学院

**发明人:** Coelho; Pedro S.|Brustad; Eric M.|Arnold; Frances H.|Wang; Zhan|Lewis; Jared C.

**摘要**

The present invention provides methods for catalyzing the conversion of an olefin to any compound containing one or more cyclopropane functional groups using heme enzymes. In certain aspects, the present invention provides a method for producing a cyclopropanation product comprising providing an olefinic substrate, a diazo reagent, and a heme enzyme; and admixing the components in a reaction for a time sufficient to produce a cyclopropanation product. In other aspects, the present invention provides heme enzymes including variants and fragments thereof that are capable of carrying out in vivo and in vitro olefin cyclopropanation reactions. Expression vectors and host cells expressing the heme enzymes are also provided by the present invention.

**主权项** 专利度: 30 特征度: 5

A reaction mixture for producing a cyclopropanation product, the reaction mixture comprising an olefinic substrate, a carbene precursor, and a heme enzyme.

**申请主权项** 专利度: 30 特征度: 5

A reaction mixture for producing a cyclopropanation product, the reaction mixture comprising an olefinic substrate, a carbene precursor, and a heme enzyme.

**法律描述**

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: COELHO, PEDRO S. (date: 20140224)

Patent Assignor: BRUSTAD, ERIC M. (date: 20140204)

Patent Assignor: ARNOLD, FRANCES H. (date: 20140203)

Patent Assignor: WANG, ZHAN (date: 20140203)

Correspondent: JOE C. HAO, KILPATRICK TOWNSEND & STOCKTON LLP, 2 EMBARCADERO CENTER, EIGHTH FLOOR, SAN FRANCISCO, CA 94111-3834

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 EAST CALIFORNIA BLVD., PASADENA, CALIFORNIA, 91125)

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: LEWIS, JARED C. (date: 20140220)

Correspondent: JOE C. HAO, KILPATRICK TOWNSEND & STOCKTON LLP, 2 EMBARCADERO CENTER, EIGHTH FLOOR, SAN FRANCISCO, CA 94111-3834

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 EAST CALIFORNIA BLVD., PASADENA, CALIFORNIA, 91125)

**引用/自引用/引用公司数:** 78/1/53

**被引用/被自引用/被引用公司数:** 1/1/1

**同族** 6

**法律状态** Valid

**In vivo and in vitro olefin cyclopropanation catalyzed by heme enzymes**

**公开号:** [WO2014058744](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=17471244&sv=2222814eee406ebb9411df1d00c1e929) **申请号:** US2013/063577

**申请日:** 2013/10/04 **公开日:** 2014/04/17

**申请人:** 加州理工学院

**发明人:** COELHO,Pedro S.|BRUSTAD,Eric M.|ARNOLD,Frances H.|WANG,Zhan|LEWIS,Jared C.

**摘要**

The present invention provides methods for catalyzing the conversion of an olefin to any compound containing one or more cyclopropane functional groups using heme enzymes. In certain aspects, the present invention provides a method for producing a cyclopropanation product comprising providing an olefinic substrate, a diazo reagent, and a heme enzyme; and admixing the components in a reaction for a time sufficient to produce a cyclopropanation product. In other aspects, the present invention provides heme enzymes including variants and fragments thereof that are capable of carrying out in vivo and in vitro olefin cyclopropanation reactions. Expression vectors and host cells expressing the heme enzymes are also provided by the present invention.

**主权项** 专利度: 86 特征度: 11

A method for producing a cyclopropanation product,the method comprising:(a)providing an olefinic substrate,a diazo reagent,and a heme enzyme;and (b)admixing the components of step (a)in a reaction for a time sufficient to produce a cyclopropanation product.

**引用/自引用/引用公司数:** 32/0/26

**In vivo and in vitro olefin cyclopropanation catalyzed by heme enzymes**

**公开号:** [EP2906518](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=12966518&sv=a19f7a23a4d5de7647e9a520bbec999b) **申请号:** EP20130845063

**申请日:** 2013/10/04 **公开日:** 2015/08/19

**申请人:** 加州理工学院

**发明人:** Coelho,Pedro S.|Brustad,Eric M.|Arnold,Frances H.|Wang,Zhan|Lewis,Jared C.

**摘要**

The present invention provides methods for catalyzing the conversion of an olefin to any compound containing one or more cyclopropane functional groups using heme enzymes. In certain aspects, the present invention provides a method for producing a cyclopropanation product comprising providing an olefinic substrate, a diazo reagent, and a heme enzyme; and admixing the components in a reaction for a time sufficient to produce a cyclopropanation product. In other aspects, the present invention provides heme enzymes including variants and fragments thereof that are capable of carrying out in vivo and in vitro olefin cyclopropanation reactions. Expression vectors and host cells expressing the heme enzymes are also provided by the present invention.

**主权项** 专利度: 79 特征度: 28

A method for producing a cyclopropanation product, the method comprising:

(a) providing an olefinic substrate, a diazo reagent, and a heme enzyme; and

(b) admixing the components of step (a) in a reaction for a time sufficient to produce a cyclopropanation product.

**引用/自引用/引用公司数:** 29/0/24

**In vivo and in vitro carbene insertion and nitrene transfer reactions catalyzed by heme enzymes**

**公开号:** [WO2014058729](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=17471229&sv=8f9c886b6ad4809432976a0b6cd3e565) **申请号:** US2013/063428

**优先权日:** 2013/06/21 **申请日:** 2013/10/04 **公开日:** 2014/04/17

**申请人:** 加州理工学院

**发明人:** COELHO,Pedro S.|ARNOLD,Frances H.|BRUSTAD,Eric M.|WANG,Zhan

**摘要**

This invention relates to the use of heme-containing enzymes to catalyze carbene and nitrene insertion and transfer reactions with greater selectivity, mild reaction conditions, and convenient production.

**主权项** 专利度: 16 特征度: 19

providing a N-H containing substrate,a diazo carbene precursor and an engineered heme enzyme;and allowing the reaction to proceed for a time sufficient to form a product having a new C-N bond.2.The method of claim 1,wherein the N-H containing substrate is an aryl amine.3.The method of claim 1,wherein the N-H containing substrate is an aliphatic amine.4.The method of claim 1,wherein the diazo carbene precursor is an aryl diazo carbene precursor.5.The method of claim 1,wherein the diazo carbene precursor is an aliphatic diazo carbene precursor.6.The method of claim 1,wherein the engineered heme enzyme is a cytochrome P450 enzyme or a variant thereof.7.The method of claim 6,wherein the cytochrome P450 enzyme is expressed in a bacterial,archaeal or fungal host organism.8.The method of claim 6,wherein the cytochrome P450 enzyme is a P450 BM3 enzyme or a variant thereof.9.The method of claim 8,wherein the cytochrome P450 BM3 enzyme comprises the amino acid sequence set forth in SEQ ID NO:1 or a variant thereof.10.The method of any one of claims 6 to 9,wherein the cytochrome P450 enzyme variant comprises a mutation at the axial position of the heme coordination site.11.The method of claim 10,wherein the mutation is an amino acid substitution of Cys with a member selected from the group consisting of Ala,Asp,Arg,Asn,Glu,Gin,Gly,His,He,Lys,Leu,Met,Phe,Pro,Ser,Thr,Trp,Tyr and Val at the axial position.12.The method of claim 10,wherein the mutation is an amino acid substitution of Cys with Asp or Ser at the axial position.13.The method of any one of claims 8 to 12,wherein the P450 BM3 enzyme variant comprises at least one,two,three,four,five,six,seven,eight,nine,ten,eleven,twelve,or all thirteen of the following amino acid substitutions in SEQ ID NO:1 :V78A,F87V,P142S,T175I,A184V,S226R,H236Q,E252G,T268A,A290V,L353V,I366V,and E442K.14.The method of claim 6,wherein the cytochrome P450 enzyme variant comprises a T268A mutation and/or a C400X mutation in SEQ ID NO:1 ,wherein X is any amino acid other than Cys.15.The method of claim 6,wherein the cytochrome P450 enzyme variant comprises a T438S mutation and/or a C400X mutation in SEQ ID NO:1 ,wherein X is any amino acid other than Cys.16.The method of claim 6,wherein the engineered heme enzyme comprises a fragment of the cytochrome P450 enzyme or variant thereof.17.The method of claim 6,wherein the engineered heme enzyme is a cytochrome P450 BM3 enzyme variant selected from Table 4,Table 5,Table 6 and Table 9.18.The method of claim 1,wherein the product is a compound of Formula la:wherein:the dotted circle A is an optionally substituted aryl group,wherein the nitrogen represents an endocyclic nitrogen atom which is part of ring A or an exocyclic nitrogen atom bonded to a ring atom of A;Pv1 is a member selected from the group consisting of hydrogen,an optionally substituted alkyl,and cyano;R2 is a member selected from the group consisting of hydrogen,an optionally substituted alkyl,an optionally substituted aryl,an optionally substituted heteroaryl,and an optionally substituted heterocyclyl;R3 is a member selected from the group consisting of hydrogen and an optionally substituted alkyl,X is a heteroatom selected form the group consisting of S,O and NR,wherein R is hydrogen or optionally substituted alkyl;and L1 is an optionally substituted alkyl or hydrogen.19.The method of claim 18,wherein R2 is an optionally substituted aryl group.20.The method of claim 19,wherein R2 is an optionally substituted phenoxybenzyl.21.The method of claim 18,wherein A is an optionally substituted aryl group and the nitrogen is exocyclic.22.The method of claim 18,wherein L1 is an isopropyl group.23.The method of claim 21,wherein A is an analinyl group optionally substituted with 1 to 5 substituents,which may be the same or different,selected from the group consisting of a halogen atom,an alkyl,haloalkyl,phenyl,alkoxy,haloalkoxy,cycloalkoxy,phenoxy,alkenyl,haloalkenyl,alkynyl,haloalkynyl,alkoxyalkyl,alkenyloxy,haloalkenyloxy,alkynyloxy,haloalkynyloxy,alkylthio,haloalkylthio,alkylsulfoxyl,acyl,alkoxyalkoxy,alkenylthio,alkoxycarbonyl,haloalkoxycarbonyl,alkynyloxycarbonyl,alkenyloxycarbonyl,nitro,and haloalkenylthio.24.The method of claim 23,wherein the compound is a member selected from the group consisting of cyano(3-phenoxyphenyl)methyl 2-((2-fluoro-4-(trifluoromethyl)phenyl)amino)-3-methylbutanoate;cyano(3-fluoro-5-phenoxyphenyl)methyl 2-((2-chloro-4-(trifluoromethyl)phenyl)amino)-3 -methylbutanoate;cyano(4-fluoro-3 -phenoxyphenyl)methyl 2-((2-chloro-4-(trifluoromethyl)phenyl)amino)-3 -methylbutanoate;cyano(2-fluoro-5 -phenoxyphenyl)methyl 2-((2-chloro-4-(trifluoromethyl)phenyl)amino)-3 -methylbutanoate;cyano(3-phenoxyphenyl)methyl 2-((2-fluoro-4-((trifluoromethyl)thio)phenyl)amino)-3-methylbutanoate;and (2,5-dioxo-3-(prop-2-yn-l-yl)imidazolidin-l-yl)methyl 3-methyl-2-((4-(trifiuoromethyl)phenyl)amino)butanoate.25.The method of claim 18,wherein A is an optionally substituted aryl group and the nitrogen is endocylic.26.The method of claim 25,wherein A is an optionally substituted pyrroyl group optionally substituted with 1 to 4 substituents,which may be the same or different,selected from the group consisting of a halogen atom,an alkyl,haloalkyl,phenyl,alkoxy,haloalkoxy,cycloalkoxy,phenoxy,alkenyl,haloalkenyl,alkynyl,haloalkynyl,alkoxyalkyl,alkenyloxy,haloalkenyloxy,alkynyloxy,haloalkynyloxy,alkylthio,haloalkylthio,alkylsulfoxyl,acyl,alkoxyalkoxy,alkenylthio,alkoxycarbonyl,haloalkoxycarbonyl,alkynyloxycarbonyl,alkenyloxycarbonyl,nitro,and haloalkenylthio.27.The method of claim 26,wherein R2 has the formula:wherein X is a member selected from the group consisting of O,S and NR,wherein R is hydrogen or optionally substituted alkyl;and R4 is a member selected from the group consisting an alkyl,haloalkyl,alkoxy,haloalkoxy,cycloalkoxy,phenoxy,alkenyl,haloalkenyl,alkynyl,haloalkynyl,alkoxyalkyl,alkenyloxy,haloalkenyloxy,alkynyloxy,haloalkynyloxy,phenyl,phenyoxy,thiophenyl,benzyl and furyl.28.The method of claim 26,wherein the compound is a member selected from the group consisting 3-phenoxybenzyl 3-methyl-2-(lH-pyrrol-l-yl)butanoate,cyano(3-phenoxyphenyl)methyl 3-methyl-2-(lH-pyrrol-l-yl)butanoate.29.The method of claim 18,wherein R2 is an optionally substituted benzylpyrrolyl.30.The method of claim 29,wherein the compound is (3-benzyl-lH-pyrrol-1 -yl)methyl 2-((2-chloro-4-(trifluoromethyl)phenyl)amino)-3 -methylbutanoate .31.The product made according to any one of the claims 1-30.

**引用/自引用/引用公司数:** 44/1/36

**同族** 6

**Heterojunction wire array solar cells**

**授权号:** [US9263612](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=9263612&sv=4a4a258355227361f4ac057c4b5a4b8f) **申请号:** 13/070,337

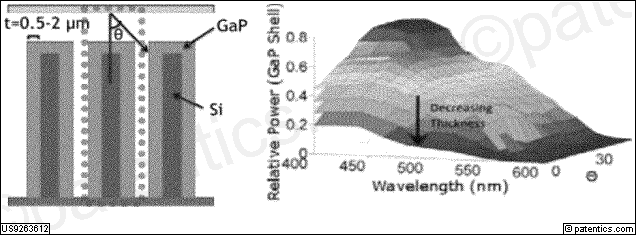
**申请日:** 2011/03/23  **授权日:** 2016/02/16

**申请人:** 加州理工学院

**发明人:** Tamboli; Adele|Turner-Evans; Daniel B.|Malhotra; Manav|Atwater; Harry A.

**摘要**

This disclosure relates to structures for the conversion of light into energy. More specifically, the disclosure describes devices for conversion of light to electricity using ordered arrays of semiconductor wires coated in a wider band-gap material.



**主权项** 专利度: 18 特征度: 20

A microstructure for converting solar energy to electricity comprising:

a vertically aligned array of semiconducting rods of a first semiconductive material epitaxially coated with a coating material of a second semiconductive material comprising a III-V material having a band-gap wider than the band-gap of the semiconducting rods of the vertically aligned array of semiconducting rods,

wherein the first semiconductive material directly contacts the second semiconductive material and forms a heterojunction,

wherein the coating material absorbs a first portion of incident light and the semiconducting rods absorb a second portion of the incident light,

wherein each rod of the vertically aligned array of semiconductor rods has a diameter of 1 to about 10 micrometers and

wherein the coating material is about 0.5 micrometers to about 2.5 micrometers thick and absorbs from 34% to 80% of photons having energies above the band-gap of the coating material, and

wherein the optical adsorption of the microstructure is enhanced by the coating material having a substantially rough surface.

**申请主权项** 专利度: 33 特征度: 6

A microstructure for converting solar energy to electricity comprising:

a~~n~~ vertically aligned array of semiconducting rods ~~coated with a wider band-gap coating material~~of a first semiconductive material epitaxially coated with a coating material of a second semiconductive material comprising a III-V material having a band-gap wider than the band-gap of the semiconducting rods of the vertically aligned array of semiconducting rods,

wherein the first semiconductive material directly contacts the second semiconductive material and forms a heterojunction,

wherein the coating material absorbs a first portion of incident light and the semiconducting rods absorb a second portion of the incident light,

wherein each rod of the vertically aligned array of semiconductor rods has a diameter of 1 to about 10 micrometers and

wherein the coating material is about 0.5 micrometers to about 2.5 micrometers thick and absorbs from 34% to 80% of photons having energies above the band-gap of the coating material, and

wherein the optical adsorption of the microstructure is enhanced by the coating material having a substantially rough surface.

**法律描述**

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: MALHOTRA, MANAV (date: 20110322)

Patent Assignor: TAMBOLI, ADELE (date: 20110321)

Patent Assignor: TURNER-EVANS, DANIEL B. (date: 20110323)

Patent Assignor: ATWATER, HARRY A. (date: 20110321)

Correspondent: JOSEPH R. BAKER, JR., 4660 LA JOLLA VILLAGE DRIVE, SUITE 750, SAN DIEGO, CA 92122

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 E. CALIFORNIA BLVD., M/C 210-85, PASADENA, CALIFORNIA, 91125)

**引用/自引用/引用公司数:** 94/2/46

**法律状态** Valid

**Method for reuse of wafers for growth of vertically-aligned wire arrays**

**授权号:** [US8455333](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=8455333&sv=fca4246b3e1cf507411b2d1a22bd84f1) **申请号:** 13/550,395

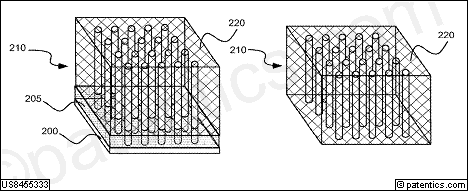
**优先权日:** 2007/08/28 **申请日:** 2012/07/16 **授权日:** 2013/06/04

**申请人:** 加州理工学院

**发明人:** Spurgeon; Joshua M.|Plass; Katherine E.|Lewis; Nathan S.|Atwater; Harry A.

**摘要**

Reusing a Si wafer for the formation of wire arrays by transferring the wire arrays to a polymer matrix, reusing a patterned oxide for several array growths, and finally polishing and reoxidizing the wafer surface and reapplying the patterned oxide.



**主权项** 专利度: 20 特征度: 15

A method for fabricating semiconductor structures comprising the steps of:

(a) fabricating semiconductor structures on a Si substrate comprising forming a templated oxide layer on the substrate, wherein the template for the templated oxide layer comprises openings in the oxide layer for the formation of semiconductor structures; and growing a set of semiconductor structures on the substrate, wherein the semiconductor structure growth is supported by a catalyst deposited in the openings in the oxide layer;

(b) partially embedding the fabricated semiconductor structures in a binder material matrix;

(c) releasing the fabricated semiconductor structures from the substrate; and

(d) reusing the substrate for fabricating additional semiconductor structures by etching and cleaning the Si substrate and repeating steps (a) through (c).

**申请主权项** 专利度: 20 特征度: 15

A method for fabricating semiconductor structures comprising the steps of:

(a) fabricating semiconductor structures on a Si substrate comprising forming a templated oxide layer on the substrate, wherein the template for the templated oxide layer comprises openings in the oxide layer for the formation of semiconductor structures; and growing a set of semiconductor structures on the substrate, wherein the semiconductor structure growth is supported by a catalyst deposited in the openings in the oxide layer;

(b) partially embedding the fabricated semiconductor structures in a binder material matrix;

(c) releasing the fabricated semiconductor structures from the substrate; and

(d) reusing the substrate for fabricating additional semiconductor structures by etching and cleaning the Si substrate and repeating steps (a) through (c).

**法律描述**

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: SPURGEON, JOSHUA M. (date: 20080730)

Patent Assignor: PLASS, KATHERINE E. (date: 20080730)

Patent Assignor: LEWIS, NATHAN S. (date: 20080815)

Patent Assignor: ATWATER, HARRY A. (date: 20080909)

Correspondent: JOSEPH R. BAKER, JR., 4660 LA JOLLA VILLAGE DRIVE, SUITE 750, SAN DIEGO, CA 92122

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 E. CALIFORNIA BOULEVARD, MS 201-85, PASADENA, CALIFORNIA, 91125)

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: CONFIRMATORY ASSIGNMENT

Patent Assignor: SPURGEON, JOSHUA M. (date: 20080730)

Patent Assignor: PLASS, KATHERINE E. (date: 20080730)

Patent Assignor: LEWIS, NATHAN S. (date: 20080815)

Patent Assignor: ATWATER, HARRY A. (date: 20080909)

Correspondent: JOSEPH R. BAKER, JR., 4660 LA JOLLA VILLAGE DRIVE, SUITE 750, SAN DIEGO, CA 92122

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 E CALIFORNIA BLVD, MS 201-85, PASADENA, CALIFORNIA, 91125)

**引用/自引用/引用公司数:** 49/2/24

**同族** 20

**法律状态** Valid

**Polymer-embedded semiconductor rod arrays**

**授权号:** [US8110898](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=8110898&sv=a159a3f454bfb0bbf95b04e48f526ed8) **申请号:** 12/176,065

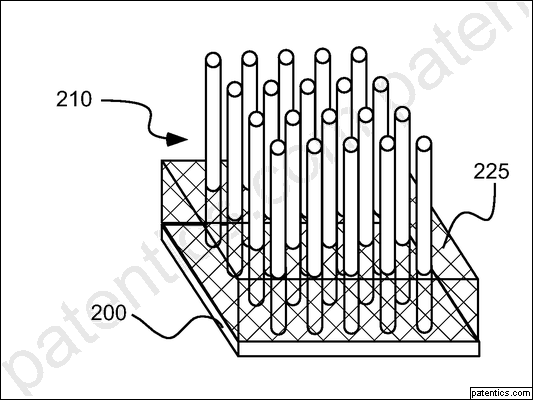
**优先权日:** 2008/05/13 **申请日:** 2008/07/18 **授权日:** 2012/02/07

**申请人:** 加州理工学院

**发明人:** Lewis; Nathan S.|Plass; Katherine E.|Spurgeon; Joshua M.|Atwater; Harry A.

**摘要**

A structure consisting of well-ordered semiconductor structures embedded in a binder material which maintains the ordering and orientation of the semiconductor structures. Methods for forming such a structure include forming the semiconductor structures on a substrate, casting a binder material onto the substrate to embed the semiconductor structures in the binder material, and separating the binder material from the substrate at the substrate. These methods provide for the retention of the orientation and order of highly ordered semiconductor structures in the separated binder material.



**主权项** 专利度: 10 特征度: 8

A structure comprising:

a binder material layer; and

an ordered array of spaced apart semiconductor structures,

wherein each one of the semiconductor structures has a length dimension and wherein the semiconductor structures are conformably constrained along at least a portion of the length dimension of each semiconductor structure within the binder material layer, wherein the diameter of the semiconductor structure is about 1.5 μm to 50 μm and the aspect ratio is greater than 1.

**申请主权项** 专利度: 20 特征度: 7

A structure comprising:

a binder material layer; and

an ordered array of spaced apart semiconductor structures,

wherein each one of the semiconductor structures has a length dimension and wherein the semiconductor structures are conformably constrained along at least a portion of the length dimension of each semiconductor structure within the binder material layer, wherein the diameter of the semiconductor structure is about 1.5 μm to 50 μm and the aspect ratio is greater than 1.

**法律描述**

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: CONFIRMATORY LICENSE (SEE DOCUMENT FOR DETAILS).

Patent Assignor: CALIFORNIA INSTITUTE OF TECHNOLOGY (date: 20101025)

Correspondent: MARK P. DVORSCAK, U. S. DEPT. OF ENERGY, IPLD, 9800 S. CASS AVENUE, ARGONNE, IL 60439

Patent Assignee: ENERGY, UNITED STATE DEPARTMENT OF (address: 1000 INDEPENDENCE AVENUE, S.W., WASHINGTON, DISTRICT OF COLUMBIA, 20585)

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: LEWIS, NATHAN S. (date: 20080806)

Patent Assignor: PLASS, KATHERINE E. (date: 20080731)

Patent Assignor: SPURGEON, JOSHUA M. (date: 20080731)

Patent Assignor: ATWATER, HARRY A. (date: 20080909)

Correspondent: STEINFL & BRUNO, 301 N LAKE AVE STE 810, PASADENA, CA 91101

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 E. CALIFORNIA BLVD. M/C 201-85, PASADENA, CALIFORNIA, 91125)

**引用/自引用/引用公司数:** 46/0/24

**被引用/被自引用/被引用公司数:** 7/0/6

**同族** 17

**法律状态** Valid

**Method for reuse of wafers for growth of vertically-aligned wire arrays**

**授权号:** [US7910461](http://www.patentics.com/invokexml.do?sf=ShowPatent&spn=7910461&sv=03afab6c142e8abc3f70f022f687b260) **申请号:** 12/176,100

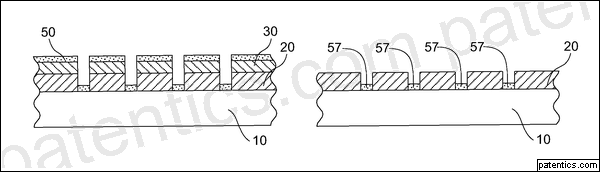
**优先权日:** 2008/05/13 **申请日:** 2008/07/18 **授权日:** 2011/03/22

**申请人:** 加州理工学院

**发明人:** Spurgeon; Joshua M.|Plass; Katherine E.|Lewis; Nathan S.|Atwater; Harry A.

**摘要**

Reusing a Si wafer for the formation of wire arrays by transferring the wire arrays to a polymer matrix, reusing a patterned oxide for several array growths, and finally polishing and reoxidizing the wafer surface and reapplying the patterned oxide.



**主权项** 专利度: 19 特征度: 15

A method for fabricating semiconductor structures comprising the steps of:

(a) fabricating semiconductor structures on a Si substrate comprising forming a templated oxide layer on the substrate, wherein the template for the templated oxide layer comprises openings in the oxide layer for the formation of semiconductor structures; and growing a set of semiconductor structures on the substrate, wherein the semiconductor structure growth is supported by a catalyst deposited in the openings in the oxide layer;

(b) encapsulating the fabricated semiconductor structures in a binder material matrix;

(c) releasing the fabricated semiconductor structures from the substrate; and

(d) reusing the substrate for fabricating additional semiconductor structures by etching and cleaning the Si substrate and repeating steps (a) through (c).

**申请主权项** 专利度: 20 特征度: 7

A method for fabricating semiconductor structures comprising the steps of:

(a) fabricating semiconductor structures on a Si substrate~~;~~ comprising forming a templated oxide layer on the substrate, wherein the template for the templated oxide layer comprises openings in the oxide layer for the formation of semiconductor structures; and growing a set of semiconductor structures on the substrate, wherein the semiconductor structure growth is supported by a catalyst deposited in the openings in the oxide layer;

(b) encapsulating the fabricated semiconductor structures in a binder material matrix;

(c) releasing the fabricated semiconductor structures from the substrate; and

(d) reusing the substrate for fabricating additional semiconductor structures by etching and cleaning the Si substrate and repeating steps (a) through (c).

**法律描述**

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: CONFIRMATORY LICENSE (SEE DOCUMENT FOR DETAILS).

Patent Assignor: CALIFORNIA INSTITUTE OF TECHNOLOGY (date: 20081009)

Correspondent: MARK P. DVORSCAK, U. S. DEPT. OF ENERGY, IPLD, 9800 S. CASS AVE, ARGONNE, IL 60439

Patent Assignee: UNITED STATES DEPARTMENT OF ENERGY (address: 1000 INDEPENDENCE AVE., S.W., WASHINGTON, DISTRICT OF COLUMBIA, 20585)

ASSIGNMENT OF ASSIGNORS INTEREST

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Patent Assignor: SPURGEON, JOSHUA M. (date: 20080730)

Patent Assignor: PLASS, KATHERINE E. (date: 20080730)

Patent Assignor: LEWIS, NATHAN S. (date: 20080815)

Patent Assignor: ATWATER, HARRY A. (date: 20080909)

Correspondent: STEINFL & BRUNO, 301 N LAKE AVE STE 810, PASADENA, CA 91101

Patent Assignee: CALIFORNIA INSTITUTE OF TECHNOLOGY (address: 1200 E. CALIFORNIA BLVD. M/C 201-85, PASADENA, CALIFORNIA, 91125)

**引用/自引用/引用公司数:** 45/0/23

**被引用/被自引用/被引用公司数:** 7/3/5

**同族** 17

**法律状态** Valid

**主权项修订统计**

总计12篇;

无对比7篇;

对比5篇;

主权项被修订3篇;

主权项被插入7处;

主权项被删除3处;

主权项保留16处;

主权项没有修订2篇