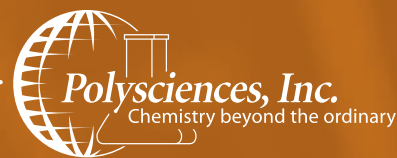


PolyFacts

News | Views | Insights from ...

Monomers / Polymers

Vol. 1 | No. 1



PolyPointer

2006-2007 Catalog!

New look AND loaded with new products.

Order Yours Today!

www.polysciences.com

IN THIS ISSUE . . .

Welcome	1
Carbazole Monomers and Polymers	2
Novel Biodegradable Polyethylene Glycol-Lactic Acid Block Polymers	3
Furan Building Blocks - Organic Intermediates	4
Fluorescent Acrylic Monomers	4

Welcome. . .

To the Redesigned *PolyFacts* for Monomers & Polymers

Readers will notice immediately that we have made some changes to our newsletter format. But what did not change is our commitment to inform our customers of new Polysciences' products, emerging areas of technology, new applications and uses for the wide variety of products we offer. We hope you will continue to find *PolyFacts* a valuable, concise resource for your research needs.

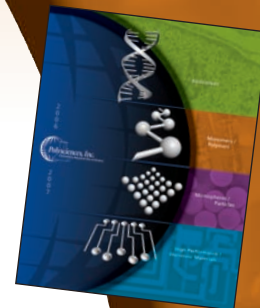
About the changes

First you might notice the newsletter focus on Monomers & Polymers. Polysciences has been publishing *PolyFacts* on a quarterly basis for a number of years. Historically, every *PolyFacts* featured articles highlighting each of our business segments spanning BioSciences to Electronic Materials.

Our customers suggested that a newsletter concentrated and targeted to specific areas of technology would be more valuable. We listened! Now, we intend to publish *PolyFacts* with each having a focus.

We see continuing trends toward the use of polymers in the electronics and biological arenas where polymers with unique electronic or biodegradable characteristics are finding application. This *PolyFacts* edition highlights new offerings in these areas.

In addition to maintaining an extensive inventory of monomers and polymers useful as basic building blocks in a variety of applications, we continue to add products we believe you will find thought provoking.



Monomers & Polymers At-A-Glance

New Selection Guides Lead the Way

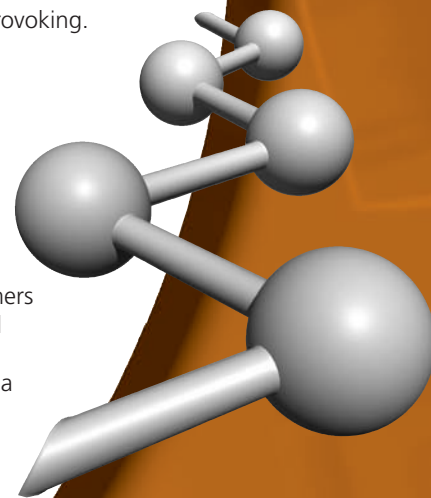
The Monomers & Polymers section of our 2006-2007 catalog now includes well organized selection guides to assist synthetic and formulation scientists, in choosing the best suited monomers or polymers for your particular applications. Polysciences stocks a wide portfolio of monomers and polymers and specializes in custom synthetic capabilities. Polysciences' knowledgeable, professional technical support specialists are ready to assist you with your monomer and/or polymer questions. The list below represents a sampling of the various product groups found in the catalog.

Monomers

- Acid Containing
- Acid Containing, Metal Salts
- Acrylic (Neutral, Monofunctional)
- Adhesion Promoting
- Amine Containing
- Crosslinking Acrylic-Difunctional
- Crosslinking Acrylic-Multifunctional
- Dual Reactive Acrylic
- Epoxides / Anhydrides / Imides
- Fluorescent Acrylic
- Fluorinated Acrylic
- High / Low Refractive Index
- Hydroxy Containing
- Mono and Difunctional Gylcol Oligomeric
- Styrenic
- UV (light) Active
- Vinyl and Ethenyl

Polymers

- Acid-functional (and salts)
- Amides
- Amine-functional
- Biodegradable
- Block Copolymers
- Conductive
- Halogen-containing
- Liquid Crystal
- Phenol-functional
- Phosphonic Acids
- Photoactive
- Reactive
- Water-soluble



www.polysciences.com

Corporate Headquarters

Polysciences, Inc.
400 Valley Road,
Warrington, PA 18976
1 (800) 523-2575 or (215) 343-6484
Fax: 1 (800) 343-3291
Email: info@polysciences.com

Europe - Germany

Polysciences Europe GmbH
Handelsstr. 3
D-69214 Eppelheim, Germany
(49) 6221-765767
Fax: (49) 6221-764620
Email: info@polysciences.de

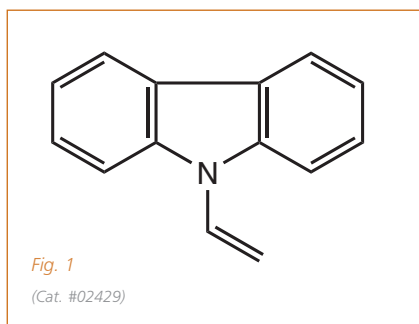
Carbazole Monomers and Polymers

Carbazole is one of a group of organic heterocyclic compounds containing a dibenzopyrrole system, also known as 9-azafluorene.¹

In general, Carbazoles are a large and intriguing group of organic compounds among which one can find dyestuffs, active pharmaceutical ingredients, and plastics.^{1,2}

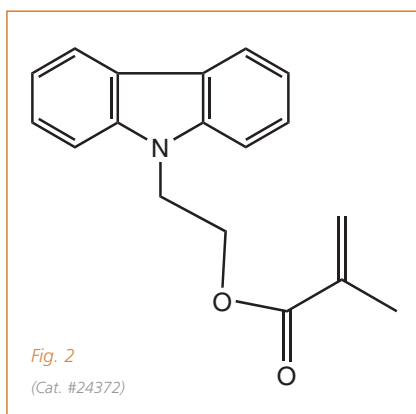
The basic heterocyclic aromatic compound containing a dibenzopyrrole system—Carbazole—is produced during coal gasification and even in cigarette smoke. Several thousand tons of carbazole are produced commercially each year from crude anthracene fractions of coal tar and crude oil. Carbazole is used as a raw material and intermediate in manufacturing of dyes (e.g., pigment Violet-23 which has broad utility in different applications from inks to contact lenses), pharmaceuticals (e.g., heterocyclic analogues of carbazole alkaloids such as Ellipticine related compounds and Indolocarbazoles that have antitumor, antiviral and protein kinase inhibitor activities), also for UV-sensitive and photoconductive polymers.

One of the interesting molecules derived from carbazole is N-Vinylcarbazole. (Fig. 1) This reactive monomer is manufactured from carbazole and acetylene at high pressures and



temperatures. Utilizing bulk, emulsion, or suspension polymerization techniques, N-Vinylcarbazole can be converted into poly(N-Vinylcarbazole), a unique organic photoconductive polymer.³ These polymers have demonstrated great utility and are of continuing interest to the electronics industry. Organic photo-conductors based on poly(N-Vinylcarbazole) are in use daily across the globe in laser printers and copy machines.

Polysciences is pleased to add a new carbazole monomer to our portfolio: 2-(9H-Carbazol-9-yl)ethyl methacrylate (Fig. 2) which has been investigated for use in non-linear optical materials. This novel monomer is a solvent soluble, crystalline solid which polymerizes readily



with a variety of monomers. Polymers derived from this monomer often show improved solubility and tractability versus poly(N-Vinylcarbazole) analogs.

Carbazole and its numerous derivatives possess both desirable physical properties and favorable conductive behavior such that numerous potential applications, such as high density optical data storage, optical image processing, phase conjugated mirrors, dynamic holography, optical computing, parallel optical logic, pattern recognition, biosensors, and biological transistors are all under current investigation. **PF**

References

- 1) Parker, S.P., Ed. In chief, McGraw-Hill Dictionary of Chemistry; McGraw-Hill Book Co.; New York, NY, 1997: 67.
- 2) <http://www.polymers.tudelft.nl/wubweb/PDF/MW60-Diduch-et-al-Synth%20Metals-139-515-520-2003.pdf>
- 3) Technical Data Sheet #263.
<http://www.polysciences.com/shop/assets/datasheets/263.pdf>

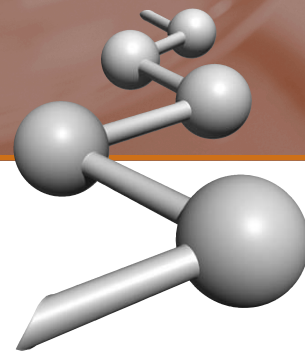
Polysciences stocks both carbazole monomers and polymers for your research

Description	Cat. #	Size
N-Vinylcarbazole	02429	100g
Poly(N-Vinylcarbazole)	02428	50g
2-(9H-Carbazol-9-yl)ethyl methacrylate	24372	1g, 5g



Request your **FREE** copy of the 2006-2007 Polysciences, Inc. catalog which contains detailed information on all of our monomers and polymers. Visit www.polysciences.com today!

Novel Biodegradable Polyethylene Glycol-Lactic Acid Block Polymers



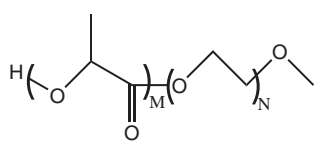
The exploration of polyethylene glycolated (PEG) materials in biosciences and pharmaceuticals has grown rapidly. Biomolecule conjugates with PEG polymer derivatives have shown increased bioavailability in contrast to the non-conjugated molecule.

Polymer structures featuring polyethylene glycol (PEG) segments with biodegradable or biocompatible segments offer micellar, nano and microsphere morphologies which are useful for controlled release formulations. When coupled with a target guest molecule, these micelles offer both a protective sheath and an ability to regulate slow release. Comb/graft or block polymer architectures are typically employed to isolate the PEG segments of the polymer to facilitate the proper formation of the micelle or microsphere morphology. Polysciences offers a wide array of glycolated, reactive monomers which enable the material scientist to design and synthesize a variety of polymer architectures having integral PEG segments.

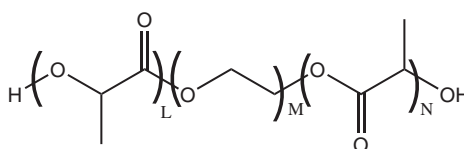
For researchers not inclined to design or synthesize their own polymers, Polysciences has an expanded portfolio of PEG block copolymers. Research in drug delivery and tissue engineering has revealed the interesting properties of polyethylene glycol-b-lactic acid copolymers. For example, PEG-b-PLA block copolymers have been used to develop formulations for carrying bone morphogenetic protein.^{1,2} Cancer researchers have also used PEG/PLA

Polymers of polylactic acid are fully biodegradable. The PLA segments in PEG/PLA diblock and triblock polymers will show similar behavior. This selection of block polymers is representative of a synthetic technology with broad structural control. If desired, other members of the family could be synthesized.

This class of highly engineered polymers will open new possibilities to researchers exploring uses of biodegradable micelles, microspheres and controlled release morphologies. All Polysciences PEG/PLA block polymers are available in 1 gram quantities. **PF**



diblock



triblock

block copolymers as micellar anticancer carriers.^{3,4} Researchers have used the block copolymers for nano/micro-sphere formulation for drug delivery purposes.^{5,6} PEG/PLA block copolymers have also been used in formulation of artificial blood systems.⁷

We have a rich selection of diblock and triblock copolymers comprising PEG and polylactic acid (PLA). The PLA segments are synthesized from d,l-lactic acid.

References

- 1) Miyamoto, S., et al, *Poly(lactic acid)-poly(ethylene glycol) block copolymer. A new biodegradable synthetic carrier for bone morphogenetic protein.* *Clin Orthop Relat Res.* **1993** Sep;(294):333-43.
- 2) Saito, N., et al, *Synthetic biodegradable polymers as drug delivery systems for bone morphogenetic proteins.* *Adv Drug Deliv Rev.* **2005** May 25;57(7):1037-48. Epub 2005 Apr 15. Review.
- 3) Liggins RT, Burt HM., *Polyether-polyester diblock copolymers for the preparation of paclitaxel loaded polymeric micelle formations.* *Adv Drug Delivery Rev.* **2002**; 54:191-202.
- 4) Liu, L., et al, *Biodegradable Poly(lactide)/Poly(ethylene glycol)/Poly(lactide) Triblock Copolymer Micelles as Anticancer Drug Carriers.* *Journal of Applied Polymer Science*, Vol. 80, **1976-1982 (2001)**
- 5) Kwon, G. D. *Diblock copolymer nanoparticles for drug delivery.* *Crit Rev Ther Drug Carrier Syst.* **1998**; 15(5):481-512. Review.
- 6) Jeong B, et al., *Biodegradable block copolymers as injectable drug-delivery systems.* *Nature.* **1997**; 388, 860-862.
- 7) Chang TM, et al., *Analysis of poly(ethylene-glycol)-poly(lactide) nanodimension artificial red blood cells in maintaining systemic hemoglobin levels and prevention of methemoglobin formation.* *Artif Cells Blood Substit Immobil Biotechnol.*, **2003**; Aug; 31, (3):231-47.

Diblock Polymers (Numbers in parentheses refer to Mw of the segment)

Description	Cat. #	Size
PEG(350)-b-PLA(300)	24375	1g
PEG(1000)-b-PLA(750)	24378	1g
PEG(1000)-b-PLA(5000)	24381	1g
PEG(5000)-b-PLA(1000)	24386	1g
PEG(5000)-b-PLA(5000)	24389	1g

Triblock Polymers (Numbers in parentheses refer to Mw of the segment)

Description	Cat. #	Size
PLA(1000)-b-PEG(1000)-b-PLA(1000)	24500	1g
PLA(2000)-b-PEG(1000)-b-PLA(2000)	24501	1g
PLA(5000)-b-PEG(1000)-b-PLA(5000)	24502	1g
PLA(1000)-b-PEG(4000)-b-PLA(1000)	24503	1g
PLA(1000)-b-PEG(10,000)-b-PLA(1000)	24509	1g

Save 20%

on Select

Poly(lactic acid)
Based Biomaterials

Offer Expires Sept. 1, 2006

Visit www.polysciences.com
for more details.

Special Limited Time Offer

To take advantage of this offer, place promotional code **0606PEGPLAW** in the "comments" field during final purchase approval when ordering via the web.

Furan Building Blocks

New Furan Based Synthons Finding Uses in Organic & Polymer Applications

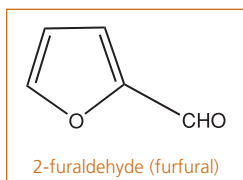
Furan based synthons are finding new uses in organic and polymer synthesis applications including pharmaceutical, graphic arts, agricultural, flavor/fragrance as well as organic intermediates industries.

Polysciences Inc. is pleased to announce the availability of a family of furan derivatives including the difficult-to-find 3rd

position substituted furanes. Unique boronic acid or halogen functional furan building blocks are appropriate for use in "Suzuki Synthesis"^{1,2} carbon-carbon bond forming reactions catalyzed by palladium. Please visit: www.polysciences.com to learn more about these exciting new materials.

2 Position Substituted Furans

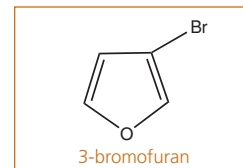
- 2-furaldehyde (furfural)
- 2-furfuryl alcohol
- 2-ethoxymethyl furan
- 2-acetyl furan
- 2-bromofuran
- 2-butanoylfuran
- 2-butyl furan
- 2-ethylfurfuryl ether
- 2-furfuryl acetate
- 2-furfuryl amine
- 2-furoic acid
- 2-heptyl furan
- 2-methyl furan
- 2-methyl furoate
- 2-methyl tetrahydrofuran
- 2-methyl tetrahydrofuroate
- 2-pentyl furan



- 2-tetrahydrofurfuryl acetate
- 2-tetrahydrofurfuryl amine
- 2-tetrahydrofurfuryl butyrate
- 2-tetrahydrofurfuryl propionate
- difuryl propane
- ditetrahydrofuryl propane
- ethyl 2-furoate
- tetrahydrofurfuryl alcohol
- tetrahydrofurfuryl benzoate
- tetrahydrofuroic acid

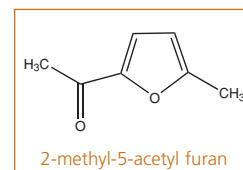
3 Position Substituted Furans

- 3-bromofuran
- 3-furaldehyde
- 3-furan boronic acid



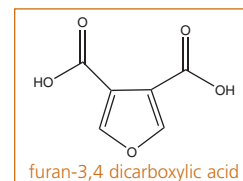
2,5 Disubstituted Furans

- 2,5 dibromofuran
- 2,5 diethyl tetrahydrofuran
- 2,5 dimethyl furan
- 2-methyl-5-acetyl furan
- 2-methyl-5-butanoylfuran
- 2-methyl-5-pentanoyl furan
- bis-(hydroxymethyl) furan
- methyl 2-bromofuran carboxylate



3,4 Disubstituted Furans

- dimethyl 3,4 furan dicarboxylate
- furan-3,4 dicarboxylic acid



For specialized derivatives of these or other furans, call for a quotation!

References

- 1) N. Miyaura and A. Suzuki, *Chem. Rev.*, 95, 2457, 1995
- 2) A. Suzuki, *Metal-catalyzed Cross Coupling Reactions*, Wiley-VCH, 49-97 (1988)
- 3) Y. Matsuya et. al. "Synthesis of a new class of furan fused tetracyclic compounds using o-quinone dimethane chemistry and investigation of their anti-viral activity", *J. Org. Chem.*, 69(23) 7989-93 2004
- 4) J.A. Castro Hermida et.al., "Anti Cryptosporidial activity of furan derivative G-1 and its inclusion complex with B-cyclodextrin," *J. Pharm. Sci.*, 93(1) 197-206 2004

Fluorescent Acrylic Monomers

Monomers with fluorescent tags are often used to build polymers that can be detected at very low concentrations using fluorescence spectroscopy. Polymer migration and diffusion has been studied using fluorescent tags.

Polymer microspheres containing fluorescent groups are used routinely for flow cytometry and medical diagnostic assays. Some examples of our range of Fluorescent Acrylic Monomers are shown at right. To learn more about our Fluorescent Monomers, please go to: <http://www.polysciences.com/shop/assets/datasheets/513.pdf> to download Technical Data Sheet #513.

Description	Cat. #	Size(s)
3,8-Dimethylacryloyl ethidium bromide	23590	100mg, 1g
Methacryloxyethyl thiocarbonyl rhodamine	23591	100mg, 1g
9-Anthracenylmethyl methacrylate	23587	100mg, 1g
Fluorescein dimethacrylate	23589	100mg, 1g
O-Methacryloyl Hoechst 33258	23592	100mg, 1g
2-Naphthyl acrylate	06024	1g
2-Naphthyl methacrylate	23602	100mg, 1g
1-Pyrenylmethyl methacrylate	23588	100mg, 1g

Turning Bright Ideas Into Reality for Over 40 Years! Custom Synthesis & Contract Manufacturing



- ◆ FDA Registered Facility ◆ GMP Compliant Batch Records
- ◆ Unique Monomers & Polymers ◆ Ultra-pure Specialty & Fine Chemicals
- ◆ Custom Synthesis to Your Specifications
- ◆ Start-Ups, Pilot Scale-Up, or Full-Scale Production

Call Us Today to See What Idea We Can Make Into a Reality for You!
U.S. & Canada: 1 (800) 523-2575, Europe:(49) 6221-765767

SAR-GEL®

SAR-GEL®, Water Indicating Paste

Catalog #24615

Water indicating paste provides a fast, reliable way to detect water bottoms in storage tanks containing gasoline and gasoline/alcohol blends, diesel, jet fuel, fuel oil, solvents and other materials.

Advantages:

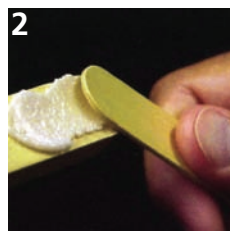
- Easy to apply - *no messy jars, no need to mix*
- No guessing - *complete color change from white to brilliant pink*
- Faster reaction - *immediate detection means less time wasted*
- Easy to see water line - *does not run*
- Fast, easy cleanup



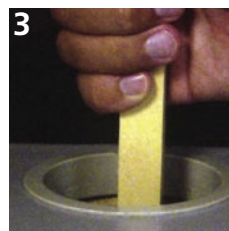
SAR-GEL® is easy to use:



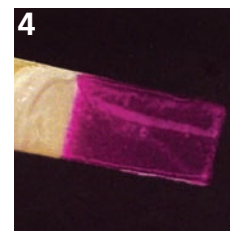
1 Apply a small amount of SAR-GEL® paste to the end of dip stick.



2 Spread over surface.



3 Insert dip stick in tank for 10 seconds.



4 Presence of water indicated where SAR-GEL® paste turns brilliant pink.

**Stock up on SAR-GEL® with our
Buy 5 Tubes, Get 1 FREE
2006 Promotion**



Catalog #24615-1 SAR-GEL® 1oz tube
Offer Expires December 31, 2006

Please use promo code: **SARGEL2006** to receive Buy 5 tubes, Get 1 free offer. Visit www.polysciences.com and enter **SARGEL2006** in the Comments field during Final Purchase Approval when ordering via the web. Web orders will not show free tube at time of purchase. One free tube will be applied to the order and appear on the invoice. Offer for buy 5 SAR-GEL tubes, get 1 FREE valid until December 31, 2006 on orders placed by phone, fax or web. Offer can not be combined with any other discount or promotion on same products.