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A. Patent Application No.(s)

B. Patent No.(s)
7014796

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Invention Title: FOCUSED MICROWAVE IRRADIATION ASSISTED SYNTHESIS OF DIVERSIFIED 2.5-DIHYDRO FIVE-MEMBER HETEROCYCLIC COMPOUNDS AS TUNABLE ELECTRON ACCEPTORS IN NONLINEAR OPTICAL CHROMOPHORES

Inventor(s): LARRY DALTON, ALEX KWAN-YUE JEN, SEN LIU, HONG MA

U.S. Filing/Issue Date: 3/21/2006

Patent or Application Serial No.: 7014796

Grant/Contract Number(s): F49620-00-1-0060

Foreign Applications filed/intended in (countries):

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The Government is hereby granted an irrevocable power to inspect and make copies of the above-identified patent application.

Signed this 28th day of March, 2006.

By Charles R. Williams, J.D., Ph.D. Charles Williams
(Name of Grantee/Contractor Official) (Signature)

Title Director, Digital Ventures

For UNIVERSITY OF WASHINGTON UW TechTransfer
(Grantee/Contractor Organization)

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UW Patent Ref#2636-3701-4252PT

Mater. Chem. 9:1905-1920, 1999. cited by other .
He, M., et al., "Synthesis of Chromophores with Extremely High Electro-Optic Activity. 1. Thiophene-Bridge-Based Chromophores," Chem. Mater. 14:4662-4668, 2002. cited by other .
Luo, J., et al., "Design, Synthesis, and Properties of Highly Efficient Side-Chain Dendronized Nonlinear Optical Polymers for Electro-Optics," Adv. Mater. 14(23):1763-1768, Dec. 3, 2002. cited by other .
Ma, H., et al., "Polymer-Based Optical Waveguides: Materials, Processing, and Devices," Adv. Mater. 14(19):1339-1365, Oct. 2, 2002. cited by other .
Melikian, G., et al., "Synthesis of Substituted Dicyanomethylendihydrofurans," Synth. Commun.25(19):3045-3051, 1995. cite- d by other .
Villemin, D., and L. Liao, "Rapid and Efficient Synthesis of 2-[3-Cyano-4-(2-Aryliden)-5, 5-Dimethyl-5H-Furan-2-Ylidene]-Malononitrile Under Focused Microwave Irradiation," Synth. Commun. 31(11):1771-1780, 2001. cited by other.

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Government Interests

STATEMENT OF GOVERNMENT LICENSE RIGHTS

This invention was made with government support under Contract No. F49620-00-1-0060, awarded by the United States Air Force Office of Scientific Research. The government has certain rights in the invention.

Claims

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for making a nonlinear optically active compound having a .pi.-donor moiety covalently coupled to a .pi.-acceptor moiety through a .pi.-electron conjugated bridge moiety, comprising irradiating with microwave irradiation a combination of a .pi.-acceptor compound and a compound having a .pi.-donor moiety covalently coupled to a .pi.-electron conjugated bridge moiety.

2. The method of claim 1, wherein the compound having a .pi.-donor moiety covalently coupled to a .pi.-electron conjugated bridge moiety comprises an aldehyde moiety.

3. The method of claim 1, wherein the .pi.-donor moiety comprises an amine group.

4. The method of claim 1, wherein the .pi.-electron conjugated bridge moiety comprises a thiophene group.

5. The method of claim 1, wherein the acceptor compound comprises a moiety having the structure: ##STR00014## wherein X is O, S, or CH.sub.2; wherein A.sub.1 is an alkyl group, an aryl group, or an electron withdrawing group; wherein A.sub.2 is an electron withdrawing group; wherein A.sub.3 is an