



US006864329B2

(12) **United States Patent**  
**Xiao et al.**

(10) **Patent No.:** **US 6,864,329 B2**  
(45) **Date of Patent:** **Mar. 8, 2005**

(54) **HYBRID ORGANIC-INORGANIC LIGHT  
EMITTING POLYMERS**

(75) Inventors: **Steven Xiao**, Laval (CA); **My T. Nguyen**, Kirkland (CA)

(73) Assignee: **American Dye Source, Inc.**, Baie D'Urfé (CA)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/233,825**

(22) Filed: **Sep. 3, 2002**

(65) **Prior Publication Data**

US 2003/0204038 A1 Oct. 30, 2003

(30) **Foreign Application Priority Data**

Apr. 16, 2002 (CA) ..... 2381833

(51) **Int. Cl.**<sup>7</sup> ..... **C08G 77/42**; C09K 11/02

(52) **U.S. Cl.** ..... **525/474**; 525/479; 252/301.35; 528/25; 528/32; 528/33; 528/37

(58) **Field of Search** ..... 525/474, 479; 528/25, 32, 33, 37; 252/301.35

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,783,480 A \* 1/1974 Booe ..... 29/25.42  
5,047,472 A \* 9/1991 Alsamarraie et al. .... 525/68  
5,247,190 A 9/1993 Friend et al.  
5,484,867 A 1/1996 Lichtenhan et al.  
5,589,562 A 12/1996 Lichtenhan et al.  
5,817,430 A 10/1998 Hsieh  
5,869,350 A 2/1999 Heeger et al.  
6,391,471 B1 \* 5/2002 Hiraoka et al. .... 428/623  
6,517,958 B1 \* 2/2003 Sellinger et al. .... 428/690  
6,518,357 B1 \* 2/2003 Rajagopalan et al. .... 524/588  
6,565,763 B1 \* 5/2003 Asakawa et al. .... 216/56

2003/0022102 A1 \* 1/2003 Hiraoka et al. .... 430/270.1

**FOREIGN PATENT DOCUMENTS**

WO WO 98/27136 6/1998

**OTHER PUBLICATIONS**

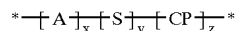
Son, S., et al., Science, 1995, 269, 376.  
Liao, L., Pang, Y., et al., Macromolecules, 2001, 34, 7300.

\* cited by examiner

*Primary Examiner*—Jeffrey B. Robertson  
(74) *Attorney, Agent, or Firm*—Goudreau Gage Dubuc

(57) **ABSTRACT**

Provided herein is an inorganic-organic hybrid conjugated polymer having opto-electronic function and a process to make the same. The disclosed polymer contains inorganic or organic bulky groups in the polymer backbone or as pendant groups and has a general formula:



wherein:

A is a bulk group, comprising at least one silsesquioxane, serving as a positional anchor for the polymer. S serving as a spacer includes alkyl, cycloalkyl group of from 1 to 30 carbon atoms, or aryl or substituted aryl of from 6 to 50 carbon atoms, or heteroaryl or substituted heteroaryl of from 4 to 50 carbons. CP represents any conjugated polymer segment at least one portion thereof comprising an opto-electronic function, for example, polyacetylenes, polyphenylenes, polyphenylenevinylenes, polythiophenes, polypyrroles, polyanilines, polyfluorenes, and any conjugated co-polymer segment. x, y and z are positive integers, where x and z is equal or greater than 1. These integers determine the configuration of such a hybrid polymer system as expressed in the above formula.

**20 Claims, 9 Drawing Sheets**