Office of Technology Management

Improved Conducting Polymer Films and Method of Manufacturing the Same by SPIAD

Technology Reference

CW046

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Field

Optoelectronics

Key Words

Conducting polymers

Surface polymerization

Film growth method

Polythiophene films

License Status

Seeking Licensing Partner

Patent Status

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Utility and PCT in progress

Overview

Surface Polymerization by Ion Assisted Deposition (SPIAD) is developed as a new film growth method. SPIAD is used to produce polythiophene conducting polymer films displaying optical fluorescence and ultraviolet/visible absorption, indicating their potential utility in various applications.

Technical Summary

SPIAD is a novel method for the growth of a wide variety of conducting polymers (including polythiophene and other conducting polymers), as well as other organic thin films. SPIAD polythiophene films are grown in vacuum by deposition onto a surface of either mass-selected or non-mass-selected thiophene ions with 100 – 200 eV kinetic energies coincident with evaporated terthiophene neutrals. X-ray photoelectron spectroscopy, surface mass spectrometry, film imaging, and film thickness measurements are applied to determine film chemistry and the extent of polymerization. These films display unique fluorescence and ultraviolet/visible absorption spectra and are being explored for photovoltaic and other applications.

Ion kinetic energy and ion to neutral ratio can be varied over a wide range in SPIAD to select films with useful optical or electronic properties. Combinatorial strategies are utilized to search for films with useful properties for a given application. Films can be easily produced on a manufacturing scale. SPIAD is being extended by use of new ions and neutral species.

Benefits

- Film chemistry tuned by deposition parameters.
- Nanoscale film thickness and morphology tuned by deposition parameters
- Environmentally friendly, "green chemistry" process.
- Covalent binding to the surface can be achieved.
- Variety of substrates can be modified, with reactivity enhanced by tuning ion energy. Substrates include: metals, semiconductors, ceramics, polymers, self-assembled monolayers, and nanotubes.

Areas of Application

- Light emitting diodes
- Electronic ink
- Electrochromic devices
- Antistatic coatings
- Recording materials
- Flat panel displays
- Organic photovoltaics and photodetectors
- Field effect transistors
- Sensor films

Publication

Downloadable papers http://www.chem.uic.edu/hanley/

Stage of Development

- Fully described and tested method
- Exploring novel film properties
- Discovering new films
- Developing organic photovoltaic devices