Derivatives of Naphthalene Diimides for Organic Electronics

Organic electronic devices are limited in use

Current methods for the production and use of organic electronic devices may have issues with scalability and electron affinity limitations. Organic electronic devices are also limited by their simple architecture and availability of metalated reagents for conjugated species.

New technology enhances production & use of organic electronic devices

Researchers at Georgia Tech have created technology that presents a new group of derivatives based on naphthalene diimide (NDI) and heterocycle naphthalene diimide groups for use in organic electronics. These molecules are functionalized with stannyl substituents and intended for use as semiconductors in organic electronics. The compounds significantly improve the potential of organic electronics, including OLEDs, OPVs (photovoltaics), OFETs, photodiodes, and other functional devices. They address several important issues, such as overcoming electron affinity limitations for their efficient use in OFETs and OPVs, enabling the creation of more intricate architectures for advanced electronic functionalities, improving the availability of metalated reagents for conjugated species. The invention also addresses scalability problems by including a method to produce monobrominated NDI, an ideal precursor for the facile syntheses of multiple other NDI derivatives with interesting electronic properties.

Summary Bullets

- This technology utilizes derivatives of naphthalene diimides (NDI) to enhance electron charge mobility in organic electronics, resulting in superior performance in devices like OLEDs and OPVs.
- Key benefits include high thermal, chemical, and photochemical stability of the materials, along with significant improvements in electron affinities and charge-carrier mobility, enabling efficient OFET operation and increased air stability.
- The derivatives have broad commercial applications in fields such as Organic Field-Effect Transistors (OFETs), flexible electronics, Organic Photovoltaic Cells (OPVs), and Organic Light

Emitting Diodes (OLEDs).

Solution Advantages

? Improves electron charge mobility in organic electronic devices.
? These materials are remarkably thermally, chemically, and photochemically stable, while presenting high electron affinities (EAs), and can yield thin semiconducting films with large charge-carrier mobility values.
? Enables OFET operation with increased air stability through adjustment of redox potentials.
? Offers versatile synthetic routes allowing for a wide range of functionalization and gamut of electronic and optical properties.

Potential Commercial Applications

? Organic Field-Effect Transistors (OFETs)
? Flexible and thin electronics
? Organic Photovoltaic Cells (OPVs)
? Organic Light Emitting Diodes (OLEDs)
? Sensing Devices for various applications

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IP Status

2 Patents have issued. : US8921553B2

Publications

Stannyl derivatives of naphthalene diimides and their use in oligomer synthesis, Organic Letters - 2012

Images

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