TECHNOLOGY OFFER

Synthetic Route to Conductive Polymers (S-PPVs and SO_2-PPVs)

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This invention provides a convenient, reliable synthetic route for the production of highly stable Thioalkyl-substituted Poly(*p*-phenylene vinylenes (S-PPVs) and sulfone-substituted PPVs (SO_2-PPVs), that are widely used in organic electronics and beyond. A scalable and efficient synthesis of so-called Gilch monomers was developed and was achieved in just two steps using low-cost starting materials and reagents. Furthermore, a polymerisation method was developed for these monomers that allows for reproducible production of soluble high-quality S-PPVs in excellent yields.

BACKGROUND

There is high demand for stable, conductive polymers in the electronics industry, where they can be used in the manufacture of OLEDs, touchscreens, field effect transistors, organic solar cells, large-area displays, and related devices.

PPVs and its derivatives are electrically conductive, light-emitting polymers that are widely used in these fields. However, the limited stability of these polymers represents a major issue. A reliable synthesis of S-PPVs and SO_2-PPVs, which are highly stable PPV derivatives, has not been achieved until now.

TECHNOLOGY

The invention provides a cost-effective way to produce high-quality thioalkyl-substituted PPVs (S-PPVs) and sulfone-substituted PPVs (SO_2-PPVs). The replacement of alkoxy substituents by thioalkyl or sulfone substituents can drastically improve the stability as well as the electronic and photophysical properties of conductive polymers without increasing their structural complexity.

The production of the monomers relies on low-cost starting materials and reagents and can be done by efficient (microwave-assisted) reactions. Furthermore, an optimized Gilch polymerisation method was developed for the production of soluble S-PPVs, which can be turned into SO_2-PPVs by selective oxidation using dimethyldioxirane.

ADVANTAGES

- Short, efficient monomer synthesis with low-cost starting materials and reagents
- Polymerisation yields of up to 90% and reproducibility through the new polymerisation process
- Scalability of monomer synthesis and polymerisation (e.g. no purification by column chromatography required)
- No palladium-catalysed steps
- Existing plants can be used for all steps of the S-PPV synthesis.
- High thermal stability of the polymers, excellent light-emitting properties

REFERENCE:
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APPLICATIONS:

Manufacture of OLEDs, field effect transistors, organic solar cells, bio-imaging

KEYWORDS:

- Thioalkyl-substituted conjugated polymers, S-PPV
- Monomer synthesis and polymerisation
- Poly(p-phenylene vinylene), PPV
- Conductive polymers

FURTHER READING:
doi.org/cwgg

OPTIONS:

- R&D collaboration
- Expertise

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