Organic semiconductor materials for improving solar cell performance

Technology #cu14323

Organic solar cells are photovoltaic devices made from carbon-based polymers and are great potential sources of renewable energy. While they currently do not reach the same efficiency as silicon solar cells, they have the benefit of being cheaper to manufacture, lighter weight, and can form bendable components. This technology describes a new structure of an organic semiconductor material which can improve the efficiency of organic solar cells. Rather than the typical fullerene-based materials, the use of perylene diimides (PDI) arranged into graphene nanoribbons in this technology improves the conversion efficiency of organic solar cells, although the PDI can additionally be used for other applications such as electroluminescent devices or field effect transistors.

Arranging PDI compounds into nanoribbons improves semiconductor behavior

A crucial step in energy conversion for solar cells is acceptance of generated electrons by the acceptor materials. By fusing together PDI monomers, the electron acceptance in organic solar cells is increased. The number of monomers fused together by this technology can be exactly defined, which enables the manufacture and resulting structure of the organic semiconductor to be precisely defined, as well.

This technology has been shown to provide a 25% improvement in efficiency versus other PDI-based organic solar cells.

Lead Inventor:

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Applications:

- Organic solar cells
- Field effect transistors
- Organic electroluminescent devices
- Organic light emitting diode (OLED) applications
• Optical memories
• Non-linear laser components

**Advantages:**
• Improves efficiency
• Highly controllable process
• Affordable manufacturing

**Patent Information:**
Patent Pending ([WO/2015/171640](https://www.wipo.int/pctdb/en/
display_pct.jsp?entry_id=WO2015171640))
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**Related Publications:**

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