A Nonconjugated Radical Polymer Glass with High Electrical Conductivity

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Conducting polymers have relied on conjugated macromolecular backbones that are subsequently chemically-doped to achieve high electrical conductivity values. Despite their impressive electrical conductivity values, certain aspects of these macromolecules are not ideal. Optical transparency at visible wavelengths can be difficult to achieve, the syntheses of advanced conducting polymers can be complicated with low yields, and chemical doping can depend on processing and lead to performance variability.

Researchers at Purdue University have developed a transparent, conducting polymer that achieves relatively high electrical conductivity values without doping and addresses the issues of conjugated macromolecular backbones. These radical polymer films present as relatively high electrical conductivity materials with high optical transparency and ambient stability. They achieved a more than 1000-fold increase in the electrical conductivity relative to other report values for radical polymers, and their ultimate conductivity of ~20 Siemens per meter is comparable to commercially-available, chemically-doped conducting polymers.

Advantages:
-High electrical conductivity w/o chemically doping
-~20 Siemens per meter
-High optical transparency

Potential Applications:
-Myriad energy storage
-Energy conversion
-Polymer thin films

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Intellectual Property:

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