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Polyhydroxyalkanoates Blended with Graphene Nanocomposites (20130048, Dr. Srienc)

Technology No. 20130048

IP Status: Issued US Patent; **Application #:** 14/291,898

Biodegradable Plastics, Rubbers and Flexible Packaging Materials

A nanocomposite material comprised of polyhydroxalkanoate (PHA) biopolymers blended with graphene nanoparticles offers enhanced strength and elastic modulus for renewable and biodegradable plastics, rubbers and flexible packaging materials. Graphene adds strength to the materials while PHA adds desirable properties such as biodegradability, biocompatibility for medical applications, and the ability to be produced from renewable feedstocks (i.e., sugars, vegetable oils, industrial and municipal waste streams, and gaseous carbon dioxide). Other expected advantages include increased melting temperature and reduced gas permeability.

Increased Electrical Conductivity

Poly(hydroxyalkanoate) (PHA) bioplastics, synthesized from renewable feedstocks, are biodegradable, renewable, biocompatible polymers that replace petroleum-derived plastics. However, many PHAs cannot be used commercially due to brittleness and lack of mechanical strength. The new PHA/graphene nanocomposites show a significant enhancement in strength and elastic modulus as compared to pure polymer samples. In addition, the combination significantly increases electrical conductivity, useful for applications in which the accumulation of static charge on the surface of the polymer is undesirable (e.g., biodegradable packaging for sensitive electronic circuit boards). The enhanced electrical conductivity combined with PHA biocompatibility could be used in medical devices (e.g., electrodes for implantable medical devices and electrically conductive extracellular matrices for tissue growth).

BENEFITS AND FEATURES:

- Blend of polyhydroxalkanoate (PHA) biopolymers with graphene nanoparticles

- Increased strength
- Enhanced elastic modulus
- Increased electrical conductivity
- Renewable and biodegradable plastics, rubbers and flexible packaging materials
- Biodegradable, renewable, biocompatible
- Produced from renewable feedstocks

APPLICATIONS:

- Biodegradable plastics
- PHA/PHB bioplastics
- Medical applications, medical devices (e.g., electrodes for implantable medical devices and electrically conductive extracellular matrices for tissue growth)
- Applications in which static charge accumulation on polymer surface is undesirable (e.g., biodegradable packaging for sensitive electronic circuit boards).

Phase of Development - Proof of Concept

Researchers

Friedrich Srienc, PhD
Professor, Chemical Engineering and Material Sciences, BioTechnology Institute
External Link (www.bti.umn.edu)
Ahmed Abdala, PhD
Associate Professor, Chemical Engineering, Texas A&M Qatar

Publications

Graphene/Polymer Nanocomposites
Macromolecules, 2010, 43 (16), pp 6515–6530

External Links

BioTechnology Institute

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