448a Dendritic Hyperbranched Polymer Modified Bioplastics: a New Hope in Green Material Research

Amar K. Mohanty and Rahul Bhardwaj

The renewable resource-based bioplastics that are recently highlighted are polyhydroxyalkanotes (PHAs) and polylactic acids (PLA). Poly (3-hydroxybutyrate), PHB and poly (3-hydroxybutyrate-co-3-hydroxyvalerate) PHBV are examples of PHA bioplastics. Major drawbacks of PHB and poly-L-lactide (PLLA) are their brittleness and low percent elongation. The possible solutions to reduce brittleness of such bioplastics are through plasticization (problem: leach-out); blending with fossil fuel derived flexible polymer (problems: incompatibility, requires high content of polymer partner) and rubber blending (problem: phase separation). The inherent brittleness has impeded their large-scale commercial applications. In our recent finding, we have identified hyperbranched polymer as a novel material to overcome the problem of brittleness in PHB and PHBV. There was more than 50% improvement in the notched Izod impact strength and elongation at break for PHB while these properties improved by more than 100% for PHBV by adding 10 wt% of hyperbranched polymer. There was a minimal sacrifice in modulus and strength of these bioplastics. Hyperbranched modified bioplastics pose tremendous opportunities in value-added new material applications. This research is financially supported by NSF award DMI-0400296 PREMISE-II.