How Biomaterials Innovation Can Help Reduce Plastic Pollution

Michael A. Saltzberg, Ph.D.
Business Director, DuPont Biomaterials
11 September 2019
Ocean Plastics Pollution is an Incredibly Complex Issue

- Government Regulations
- Waste Collection Policies
- Recycling Technology & Availability
- Consumer Behavior
- Degradation Type & Rate
- Brand Owner Choices/Design
- Packaging Materials Performance
Plastics Bring a Lot of Value

- Safety/Freshness
- Convenience
- Affordability
But that Value Comes with Massive Costs

- Fossil-based impacts on climate
- Persistence in the environment
- Impact on wildlife

Can we innovate using new materials that maintain the value and mitigate the costs?
Example # 1: Using Less Plastic to do the Same Job

- PET bottles are recyclable, unbreakable, and conveniently re-closable
- However, carbonated beverage bottles use ~10-30% more plastic than water bottles
- Driven by need to preserve freshness—PET cannot keep the carbonation inside
- Can we reduce the amount of plastic needed to preserve shelf life?
PEF: A New Polymer with ~10x Better Barrier than PET

- PEF is made from abundant renewable resources (corn starch)
- PEF allows ~10-20% light-weighting at same cost
- PEF blend/multi-layer bottles are recyclable in the existing PET stream
• Paper and cotton are made from cellulose—a natural material composed of sugars

• These “polysaccharides” are truly biodegradable since microbes recognize them as food

• Most synthetic polymers are completely inert; a few are somewhat biodegradable

Natural Products are Biodegradable
Cellulose/Paper is Often Mixed with Plastic

• Paper cups and many cardboard boxes are coated with plastic to make them water- and grease-proof

• Cellulose-based wipes often have plastic binders to give them the required strength

• Paper-based packages cannot be used in many applications due to other performance deficiencies
Example # 2: Learning from Nature to Make New Materials

- Nature makes polysaccharides inside plants using protein-based catalysts called enzymes.
- We can mimic this process to turn cane or beet sugar into polysaccharides with a variety of properties.
- These materials provide performance like synthetic polymers but are marine biodegradable.
- The process is low-energy and produces almost no waste.
Some Applications of Engineered Polysaccharides

- Plastic-free grease barrier for paper-based dry food packaging
- Replacing latex for plastic-free wipes
- Enabling higher recycled content in cardboard
- Improving performance and biodegradability of biopolymers
- Replacing latex for plastic-free wipes
Biomaterials Innovation is Part of the Solution to Ocean Pollution

- Moving from fossil-based materials to plant-based materials to reduce climate impact
- Light-weighting plastic packages while maintaining performance and recyclability
- Enabling truly biodegradable solutions by enhancing the performance of paper-based and biopolymer materials