Sep 2022

The Circular Economy: Sustainable Packaging

Consumer demand is the key driver behind innovation to develop plastic packaging alternatives, including bioplastics and post-consumer resins

Improving the trajectory towards achieving circular economy targets requires a step-change in approach to sustainable packaging adoption across fast-moving consumer goods (FMCGs). We look here at the innovation landscape across a subset of plastic packaging alternatives to better understand progress.

It is consumers or more specifically their purchasing power that can force change. One of the findings from Mintel research is the simple concept that doing things that are beneficial to the environment makes people feel happy. This is a fundamental driver of change.

Mintel are the experts in understanding what consumers want and why, and recently published their 2022 Sustainability Barometer. This report provides direct insight into a range of sustainability topics including packaging.

Most relevant is that top of the list for consumer sustainability behaviours was recyclable packaging, ahead of planning meals at home, buying fewer new clothes and reducing the consumption of meat and poultry.

Expanding on consumer understanding on the topic of plastic packaging, the report provided the following insight based on consumer responses. The percentage of responses for each statement which were "*yes I knew that*" are shown.

- In some cases, plastic packaging is better for the environment than paper: 39%
- Degradable and biodegradable packaging are not the same thing: 60%
- The inclusion of recycled content (even 100%) in a package does not always mean it can be recycled: 55%

Mintel also looked at topics through the lens of a "value action gap" between consumers' declared intent and actual behaviour. "*I try not to be harmful to the environment*" is an example of intent.

The gap between people agreeing with this and performing the simplest, most commonplace, and costless of sustainable tasks, for example recycling packaging, had a gap of 23 percentage points.

This links closely to the finding that 46% of consumers believe that companies, as opposed to governments or consumers, are most responsible for increasing the amount of packaging that is recycled.

Sustainable packaging has become an increasingly important factor in consumer decision making on product purchases, and arguably the burden of responsibility really sits with FMCG companies to meet this need. So which organisations are leading the innovation into sustainable packaging?

We take advantage of structured, cleansed and classified patent data as an independent indicator to evaluate the pace of innovation and top owners of invention across sustainable packaging specific technology areas. These include (i) Post-consumer Resin; (ii) Bioplastics – Biodegradable Compositions; and (iii) Bioplastics – Renewable Raw Materials.

Key Messages:

- Innovation in sustainable plastic alternatives has been weighted to production processes associated with deriving plastics from renewable materials. There has also been an uptick in innovation activity associated with bioplastics designed to decompose and in recyclable plastics.

- Primary and speciality chemicals companies are leading the pursuit of new and more sustainable plastic-based packaging alternatives. More broadly the top innovators in packaging are focused specifically on paper-based products such as cartons and boxes.

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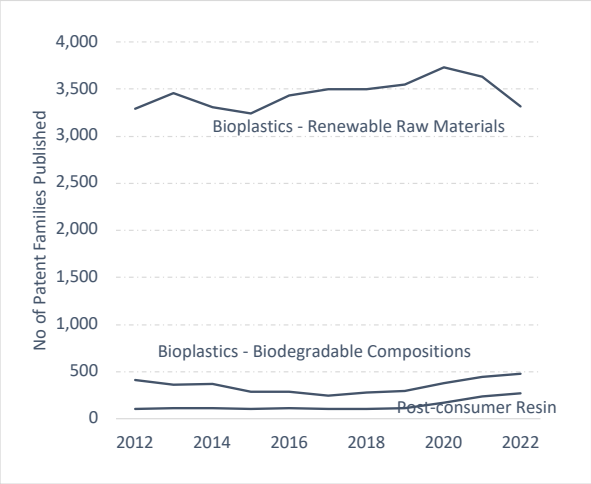
Of the three sustainable packaging material alternatives that we looked at, most of the innovation has been focused on Bioplastics – Renewable Raw Materials. These are plastics synthesised from renewable feedstocks with the innovation concentrated around production processes and additives. The pace of innovation has been steady over the last ten years with between 3,000 to 3,500 patent families published globally every year, this excludes China-only patent families.

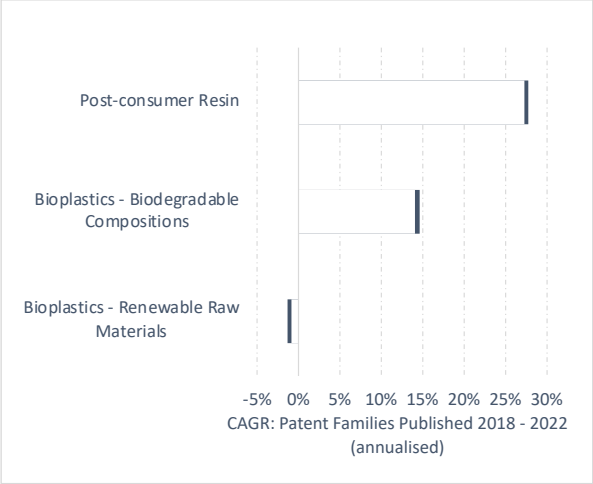
Next are Bioplastics - Biodegradable Compositions which are plastics designed to decompose at the end of the usable life. There has been an uptick in innovation activity over recent years with patent family publications in this technology area growing at a compound annual growth rate of 15% from 2018 to 2022.

Post-consumer Resins are designed to be recycled into new plastic at the end of life. The pace of innovation in this category has been the highest pace of the three but from a relatively low base, particularly when compared with Bioplastics – Renewable Raw Materials.

Pace of Invention: *Plastic packaging Alternatives*



Pace of Invention: *CAGR 2018 – 2022*



As measured by patent families published excluding China-only patent families

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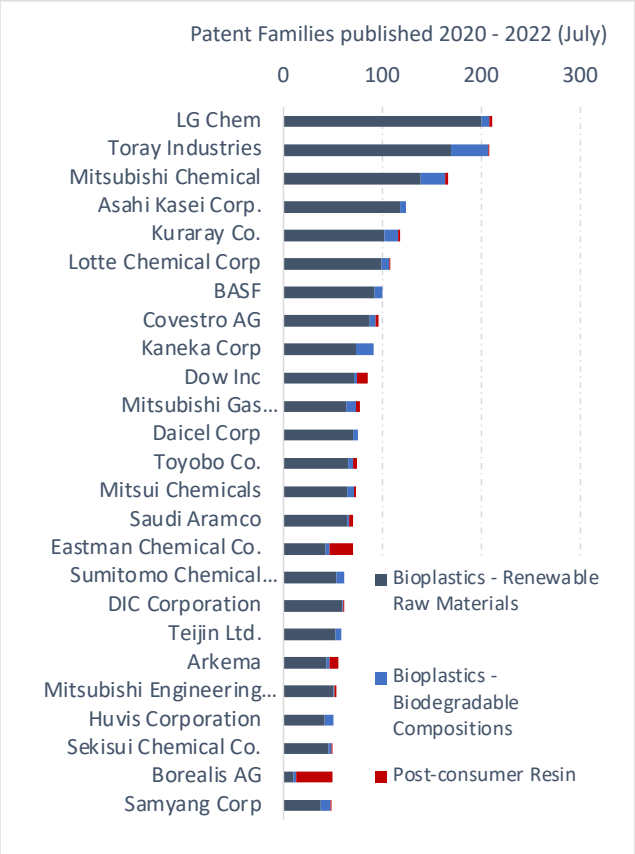
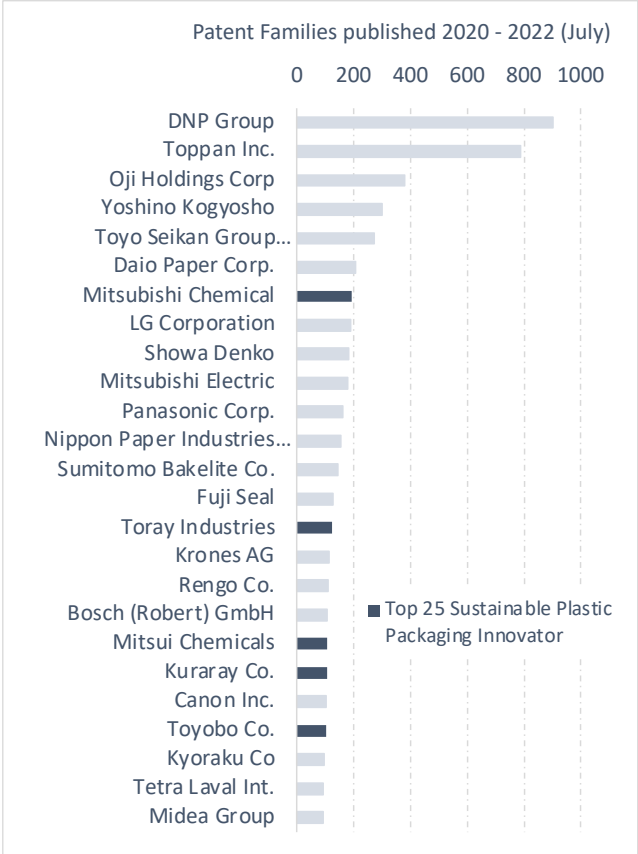
Top Innovators 2020 - 2022: *Sustainable Plastic Packaging Materials*



Top Innovators 2020 - 2022: *Packaging, generic for all types of product and goods*



Global Publications excluding China-only patent families

No surprise that many of the world's leading chemical companies are active in sustainable packaging innovation specifically associated with bioplastics and resins. Korea's LG Chem and Japanese Toray Industries lead the pack, both with a clear focus on Bioplastics – Renewable Raw Materials. Tennessee based Eastman Chemical and Austrian chemical company Borealis are notable amongst the top 25 innovators with a weighting towards Post-consumer Resins innovation. The same is also true, although to a lesser degree, for Dow Chemicals and French speciality chemicals company Arkema.

Cross-referencing the top innovators in sustainable packaging materials with top innovators in generic packaging highlights that only five of the top innovators in sustainable plastics are included within the broader list of innovative packaging companies. Many of the leading packaging players, such as Japanese groups DNP, Toppan and Oji Holdings continue to develop paper-based products.

To screen for innovators under the broad category of packaging we are using a technology classification from the Cipher Universal Technology Taxonomy. This captures innovation activity, using patents as the indicator. In this case Packaging refers to any product or products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods.

Technology Scope Notes

Bioplastics - Renewable Raw Materials:
These plastics are synthesised from compositions/ blends using a renewable feedstock. Patents refer to production processes and additives; examples of plastics are polylactide (PLA), poly(butylene succinate) (PBS), bio-polyolefins, bio-poly(ethylene terephtalic acid) (bio-PET)

Bioplastics - Biodegradable Compositions:
Biodegradable plastic compositions are plastic compositions that can be decomposed by the action of living organisms, usually microbes, into water, carbon dioxide, and biomass. The focus is on compositions and methods for making them - i.e. claims relate to the biodegradation ability of the composition, rather than on applications of the materials. This classifier is built broadly to include compositions derived from both renewable and petrochemical feedstocks. Methods for decomposing or recycling biodegradable polymers are excluded.

Post-consumer Resin (PCR):
Post-consumer resin (PCR) includes consumer packaging items that can be reprocessed into recycled plastic to make new products. Patents refer to methods for making PCR; methods for removing volatile compounds, odours, additives and stabilisers; PCR applications (e.g. bottles, packaging, etc).

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