Oxo-degradable plastics - Q&A

This Q&A is based on the outputs of the research review and subsequent peer reviews carried out on behalf of Defra on 'Assessing the environmental impacts of oxo-degradable plastics across their life cycle – EV0422'

1) What are oxo-degradable plastics? How can I tell if I am using one?

Oxo-degradable (also known as oxo-biodegradable[1]) plastics are usually made from polyethylene or polypropylene. They differ from conventional plastics in that they have small concentrations of additives (usually metal salts) that, when exposed to ultra-violet light or dry heat and mechanical stress, break the plastic into small particles which may then be further degraded by micro-organisms. These plastics will usually be labelled as 'oxo-biodegradable', 'oxo-bio' or 'biodegradable'.

2) How do oxo-degradable plastics degrade?

Oxo-degradable plastics are designed to degrade in the environment by a two-stage process. The first stage commences in the presence of oxygen ('oxidative degradation'). Exposure to heat and/or light accelerates the process. The additives initiate and accelerate break-down of the molecular structure of the plastic so that it weakens, becomes brittle and fragments into small pieces.

The time taken for the plastic to start to degrade will depend on the formulation of the additive in the plastic and the type of environmental conditions to which it is exposed. Therefore, it is not possible to accurately predict when the plastic will start to degrade, but it will usually start to occur within 2-5 years in the UK.

The second stage of the degradation process ('biodegradation') occurs when the residues from the first stage are used as a food source by naturally occurring micro-organisms. Tests have shown that oxo-degradable plastics can biodegrade to some extent under certain conditions. However, there is uncertainty over how long it takes for them to biodegrade, or whether they biodegrade completely in the environment.

3) Will oxo-degradable plastics (e.g. bags) degrade in my home?

Yes. The plastics degrade when exposed to air, so if you keep them long enough, you will start to notice the plastic breaking up. If this begins to happen, we suggest that you put what remains of the plastic in your rubbish bin.

4) Are oxo-degradable plastics the same thing as bioplastics or bio-based plastics?

No. Bioplastics (or bio-based plastics) are be made from materials like corn-starch, although they are often blended with conventional plastics made from petrochemicals. Some, but not all types of bioplastics are biodegradable. Those bioplastics that are biodegradable usually meet international standards for industrial composting such as EN13432. Oxo-degradable plastics are currently largely made from naphtha (a by-product of oil refining) and are not designed to meet composting standards.

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[1] Manufacturers of these products prefer the term 'oxo-biodegradable', which is defined by CEN as "degradation resulting from oxidative and cell-mediated phenomena, either simultaneously or successively". The research review on which this Q&A is based used the term 'oxo-degradable'. For consistency, the Q&A will use the latter, broader term (biodegradation being one form of degradation process).

5) **What is the difference between degradability, biodegradability and compostability?**

Degradation encompasses a variety of processes that result in the breakdown of a substance into simpler molecules. Biodegradation is a form of degradation where micro-organisms, such as bacteria and fungi, metabolise substances thus breaking them down. Conventional plastic such as polyethylene takes a very long time to degrade in the environment. To biodegrade it must first undergo some other degradation process to break down the very long intertwined molecular chains of the polymer.

Composting is a managed process that involves the biological decomposition and transformation of biodegradable material to produce carbon dioxide, water, minerals and organic matter (which can be sold as a soil enhancer). A plastic labelled as 'compostable' can be safely processed through an industrial composter without adversely affecting the end product. Although a compostable plastic adds little biomass to the end product, it can usefully serve as both a means of containing other compostable material and as a nutrient source for the micro-organisms during the composting process.

6) **How should I dispose of oxo-degradable plastics?**

In common with all plastic materials, the most important thing is not to allow them to litter the environment. In common with many other plastic materials, you should not send them for composting because they will interfere with the composting process.

There are differing views on whether oxo-degradable products can be safely recycled. Manufacturers of oxo-degradable plastics maintain that their products can be safely recycled before they start to degrade. Many in the recycling industry are concerned that the additives used in oxo-degradable plastics may weaken the quality of recycled product. They maintain they are unsuitable for recycling with conventional plastics and should be kept out of mainstream plastics recycling processes.

7) **Do oxo-degradable plastics degrade in landfill to generate methane?**

There is limited evidence on what happens to oxo-degradable plastics in landfill. If they are on the surface of a landfill site for enough time (i.e. with plenty of air) it is likely they will start to degrade. If they end up further down in the landfill, where there is no air, they are unlikely to break down. Either way it seems unlikely they will be a significant source of methane.

8) **Are the oxo-degradable additives (i.e. metal salts) toxic to the environment?**

The research commissioned by Defra suggests that the metal salts contained within oxo-degradable plastics are at such low concentrations that they are unlikely to be toxic to the environment.

9) **Why did it take so long to publish the second peer review?**

The delay was due to a combination of factors including peer reviewer availability and the availability of the University to respond to the comments received from the manufacturers.

10) **What is the Government doing about carrier bags?**

On 21st September 2013 the Government announced its intention to introduce a 5p charge on single use carrier bags from Autumn 2015. We are considering an exemption for biodegradable bags and will be working with industry to develop criteria and standards to determine eligibility. We will discuss with business how such exemptions will be implemented by retailers, as well as work with recyclers and reprocessors to ensure they have methods in place to cope with the charge.