The case for oxo-bio in plastics packaging

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Professor Gerald Scott, of the Oxo-biodegradable Plastics Association, explains how making plastics oxo-biodegradable can contribute to the health of the planet

Everyone is aware of public concern about plastic waste in the open environment. All plastics will fragment and be bioassimilated, but the process can take many decades. The answer is to make ordinary and recycled polymers oxo-biodegradable, and about 20 billion such products were made last year.

Formulations which cause oxobiodegradation are usually compounds of cobalt, iron, nickel or manganese and are added to conventional polymers at the extrusion stage. They reduce the molecular weight by an abiotic process in the presence of oxygen – allowing the plastic to be then consumed by bacteria and fungi more quickly than nature's lignocellulosic wastes and much more quickly than non-degradable plastics. The formulations have been tested and proved not to be eco-toxic – in particular they do not contain 'heavy metals'.

Oxo-biodegradable plastics are normally tested according to ASTM D6954-04 Standard Guide for Exposing and Testing Plastics that Degrade in the Environment by a Combination of Oxidation and Biodegradation. There are two types of Standards – Standard Guides and Standard Specifications. The 6954 was developed by the American standards organization, and the second Tier relates specifically to biodegradation.

The ASTM D6954-04 tests tell industry and consumers what they need to know – whether the plastics is (a) degradable (b) biodegradable and (c) non eco-toxic. It is not necessary to use a Standard Specification unless the material is intended for a particular purpose. D6954 provides that if composting is the designated disposal route, ASTM D6400 should be used.

ASTM D6954-04 not only provides test methods but also pass/fail criteria. For example, para. 6.6.1 requires that 60% of the organic carbon must be converted to CO_2. It is not necessary to test until 100% has been converted, because it is possible, by applying the Arrhenius relationship to predict the time at which complete biodegradation in the environment is likely to occur. D6954 tests are usually conducted by independent and accredited laboratories. I have seen many test reports and am satisfied that oxo-bio

products will totally biodegrade in the presence of oxygen. Pre-treatment does not invalidate the results as extrapolated to real-world conditions.

There is no requirement in D6954-04 for the plastics to convert to $C0_2$ in 180 days because, while short timescales are critical for industrial composting, they are not critical for biodegradation in the environment. Nature's wastes such as straw and twigs may take 10 years or more to biodegrade, but oxo-bio plastics will biodegrade more quickly than that, and much more quickly than ordinary plastics. Oxo-bio is not intended for landfill, as it is undesirable for anything to decompose deep in landfill unless the landfill is designed to collect the gas, which most are not. Deep in landfill oxo-bio will be inert, like ordinary plastic, but compostable plastic can emit methane, which is a greenhouse gas 23 times more powerful than CO_2.

It is sometimes claimed that a plastics product is not 'biodegradable' unless it can comply with EN13432 (and similar standards such as ISO 17088, ASTM D6400, ASTM D6868, and Australian 4736-2006). This is not correct. These standards are appropriate for composting but they are not suitable for products designed to biodegrade if they get into the open environment. Indeed EN13432 itself says it is not appropriate for plastics waste which ends up in the environment through uncontrolled means.

Industrial composting is not the same as biodegradation in the environment, as it is an artificial process with a much shorter timescale than the processes of nature. Compostable plastics are not suitable for home-composting. The requirement in EN13432 and similar standards for 90% conversion to CO_2 gas within 180 days is not useful even for composting, because it contributes to climate change instead of improving the soil. Nature's lignocellulosic wastes do not behave in this way. In June 2009 Germany's Institute for Energy and Environmental Research concluded that oil-based plastics, especially if recycled, have a better Life-cycle Analysis than compostable plastics.

Oxo-bio plastics can be recycled in the same way as ordinary plastics and does not need special collection points. By contrast, "compostable" plastics cannot be recycled with ordinary plastics, and will ruin the recycling process if it gets into the waste stream. Recyclers should be worried about vegetable-based plastics – but not about oxo-bio.

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