



# OXO-BIODEGRADABLE PLASTICS ASSOCIATION

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## Comment

**by Professor Gerald Scott, DSc, FRSC, C.Chem, FIMMM**

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### ***on EVO4221 “Assessing the Environmental Impacts of Oxo-degradable Plastics Across their Life-cycle***

Noreen Thomas, Jane Clarke, Andrew McLauchlin and  
Stuart Patrick of Loughborough University

Research Summary by Heather Collier, Defra

Peer Review Summary by Richard Murphy, Ramani Narayan  
and Richard Thompson

**16<sup>th</sup> March 2010**

1. The authors of the report appear to have little knowledge or experience in the abiotic degradation of polymers which underlies the environmental biodegradation of hydrocarbon plastics. This is exemplified in the belief that cross-linked polymer is a cause of residues in the soil which are resistant to biodegradation. However, one of the peer-reviewed research papers that the authors quote (Ref. 30) makes it clear that cross-linking can occur only if the residues are deprived of oxygen before they have reached the stage of embrittlement, as is not the case when plastics are exposed to the outdoor environment as mulching films.

2. The “Research Summary” was written by Defra and differs in many ways from the views expressed by stakeholders which were reported objectively within the limited knowledge of the researchers. For example, the evidence from the Oxo-biodegradable Plastics Association summarised in Section C2.2. This refers to the application of the Arrhenius relationship to the reduction of molar mass, which is the

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rate determining step under out-door environmental conditions and is not referred to by the Defra reviewer.

3. Consequently, the first “Key finding” is incorrect. This states “Although it is likely that oxo-biodegradable plastics will *start to degrade* between 2-5 years in the UK, it is unclear how long the material takes to biodegrade” This is in conflict with all the evidence from the peer reviewed papers. “Start to degrade” should have been “is converted to CO<sub>2</sub> and biomass”. The polymers start to biodegrade as soon as their programmed useful life is ended.

4. The second “Key finding” is also incorrect. It is not true that “there is any lack of evidence on the fate of oxo-biodegradable plastics in the environment” The first industrial application was in mulching films and is fully reported in the Reference section (Annex D, references 1,9, 41, 47, 52, 55,61). Mulching films have been used continuously in successive seasons in Israel, USA, Japan, China, Taiwan and some South American countries since 1975 with no evidence of residual plastics particles or loss of soil fertility year on year.

5. The final conclusion of Defra’ Research Summary is “that degradation property of oxo-degradable plastics does not improve their environmental performance” There is no basis for this conclusion in the report.

6. Although I was contacted for a short telephone interview in August 2009 I was not given an advance copy of the Report, nor asked to comment on the findings and recommendations.

7. The main stated objective of EV0422 was to assess the LCA of oxo-biodegradable plastics. I pointed out to staff at Loughborough, that the purpose of LCA is to compare the impact of different materials on the environment, and I asked whether hydro-biodegradable plastics would be the standard of comparison. The surprising answer was that bio-based plastics would be outside the scope of the investigation. This is unfortunate, since the German Institute for Energy and Environmental Research (IFEU) has carried out a more rigorous LCA study and has concluded that polyethylene sacks made from recycle have the smallest environmental impact profiles. They added that the current bags made from bioplastics have less favourable environmental impact profiles due to the process of raw-material production.

8. The question that is not explained is why the researchers selected did not have a more specialised knowledge of polymer science in relation to environmental degradation. This would have avoided some of the the non-scientific conclusions reached.

9. We must conclude from the present study that the absence of in-depth comparisons between different kinds of biodegradable plastics, and misunderstanding of the science, throws into question the conclusions arrived at. Any future study of the environmental impact of biodegradable plastics should take this into account and should involve scientists with the necessary knowledge of abiotic polymer degradation at both the research and assessment stages of the project.