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## TECHNICAL DATA SHEET

## BD 92845

Masterbatch type	<b>OXO-BIODEGRADABLE</b>
Polymer Carrier	<b>UNIVERSAL</b>
Additives	<b>Metal ion prodegradant/cellulose based microparticulate</b>
Nominal Density	<b>0.96 g/cm<sup>3</sup></b>
Issued	<b>02/02/07</b>
Approved by	<i>A. Barclay</i>

### General Comments

BD 92845 is a universal carrier based oxo-biodegradable masterbatch developed primarily for use in the packaging film industry but which has subsequently found use in a broad range of polymers and processes where it has been used to introduce a biodegradable characteristic to polymeric products.

The carrier has been chosen to give excellent compatibility with many polyolefinic and styrenic polymers and exhibits excellent high temperature stability.

The product is suitable for direct food contact applications (see attached certificate).

BD 92845 utilises a naturally sourced cellulosic additive which, due to its low particle size and high specific surface area, imparts a biodegradable characteristic whilst retaining a high level of transparency and a minimal effect on physical properties compared with the use of alternative products. In addition it contains a metal ion prodegradant system, formulated to offer a high level of controlled thermodegradation in the finished product following a period of photoexposure.

These active ingredients impart a high level of photo and thermodegradability to the finished article but incorporate a unique control system that gives a readily predictable dwell time before the degradation reaction commences.

The total additive package enhances the degradation and the compostibility of polymer substrates, leaving a reticulate structure which is then subsequently broken down under composting conditions.

Addition rates are dependent on the precise biodegradable properties required within each particular application. However, addition rates of between 1 and 5% may be necessary to give the required performance.

The product should be premixed with the polymer feedstock or metered in at the feed hopper. Processing conditions should generally be kept the same as those used for the unmodified polymer feedstock.

The Wells Plastics Technical Team is available to advise on specific usages and requirements and can be contacted on the following numbers:

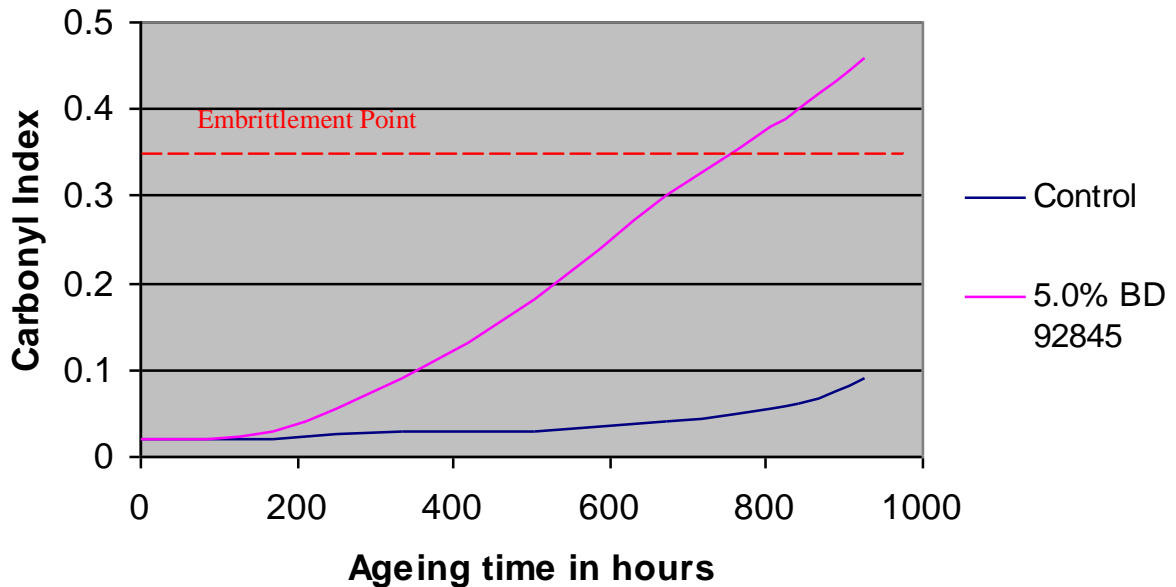
**Tel: +44 (0)1785 817421 Fax: +44 (0)1785 817771**

**e-mail: [technical@wellsplastics.com](mailto:technical@wellsplastics.com)**

*This information is correct to the best of our knowledge, but we would recommend that users make their own assessment to confirm that the material meets their requirements. We accept no liability for any damage, loss or injury resulting from the use of this information. Freedom from patent rights must not be assumed.*

## Degradation test results in PE film

### Degradation Profile of BD 92845 in PE film



Polyethylene film (25µm) was produced containing 0 and 5% addition of a universal carrier based oxo-biodegradable masterbatch, Reverte BD 92845.

The film samples were placed in a UV ageing cabinet with UVA and UVB lamps to simulate outdoor sunlight

The temperature of the cabinet was maintained at 50°C.

Samples were removed after fixed time periods and the carbonyl index determined by Infra-red analysis. In addition the films were empirically assessed for friability and state of embrittlement.

It can be seen that the control sample of PE film demonstrated fairly typical behaviour, not developing any significant carbonyl character and not even approaching a point of embrittlement during the test period.

In contrast to this, the specimens containing BD 92845 have demonstrated a highly enhanced rate of decomposition, reaching a state of embrittlement in the test chamber after around 31 days.

It is difficult to quantify this in terms of real-time degradation due to the vagaries of natural conditions, but applying Arrhenius principles to these accelerated ageing results would suggest that ageing for 12 hour days at a constant temperature of 20°C in sunlight would result in a dwell time of around 3.5 months followed by degradation to embrittlement and microfragmentation in a further 12 months

For any attempted extrapolation to real-time, however, the potential user would have to carry out his own empirical observations to ensure that the product was fit for his purpose in the precise ageing regime employed.



## Recommended Composting Conditions

BD 92845 is a hybrid product which breaks down through two routes:

The first is through the prodegradative effect of certain transition metal ions on polymers such as PE. PP and others.

The reaction is free radical initiated, ie through the action of light and heat, and results in the oxidation of the polymer chains, breaking them down into smaller and smaller polymeric units.

This results in the embrittlement and degradation of the polymer.

The second route is through the incorporation of micronised cellulosic particles into the polymer which, under appropriate composting conditions, encourage the growth of soil based micro-organisms which establish viable colonies which biodigest the polymer and filler through bio-oxidative mechanisms.

The prodegradative effect has been found to be best achieved when the polymeric product (generally thin film) is first exposed to a short period of UV exposure (a few days under the sun on a bright and sunny day) before burying in an appropriate "live" landfill or composting environment where heat is allowed to build up in an oxygen rich atmosphere and appropriately catalyse the oxo-degradation of the film.

The biodegradation through micro-organisms requires the composting site (or Windrow) to be warm, wet and have a ready supply of oxygen. Anaerobic fermentation will not be effective as the breakdown of the polymer is through an oxidative route.

The best results have been found in windrows with "smell traps" that effectively draw oxygen from the atmosphere through the windrow. This results in a warm, oxygen rich substrate that envelopes the film scraps and allows the micro-organisms to biofragment and then finally biodigest them.

Windrows that are maintained by constantly moving and turning generally give inferior results to those that are left fairly static for longer periods of time.

Superior breakdown rates are found when:

1. The plastic film is ground as small as possible prior to composting to maximise the available surface area for microbiological attack.
  2. The plastic film is subjected to a short burst of UV light before burial.
  3. The Windrow is maintained at temperature in excess of 50°C.
  4. The Windrow is not allowed to become too dry in arid periods.
  5. The Windrow is built on perforated pipes which are used to draw atmospheric oxygen through the Windrow.
  6. The Windrow is left undisturbed for as long as possible to allow maximum contact between the microbiological entities within the Windrow and the film fragments, thus allowing colonies to build up and facilitate the ultimate biofragmentation and digestion procedure.
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# FOOD CONTACT APPROVAL TESTING



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For the attention of Mr. Andrew White  
e-mail [AndrewWhite@wellsplastics.com](mailto:AndrewWhite@wellsplastics.com)

12<sup>th</sup> August 2005

Certificate number: WP 02

## Certificate of Conformity Food-Contact Plastics

A sample of LDPE film containing 5% BD 92845 has been tested by Rapra Technology Ltd. to the requirements of EC Directive 2002/72/EC, relating to plastics material and articles in contact with food. Test conditions employed were 10 days at 40°C with aqueous and fatty food simulants. The composition of BD 92845 was declared to Rapra in confidence. All additives present are approved for food contact use.

Results obtained, reported in Rapra CTR Number 44997, have demonstrated that the material complies with the extraction requirements of the Directive. Levels of migration are within the prescribed limits. Therefore, the material can safely be used with all food types at temperatures <40°C.

Rapra Technology Ltd analytical laboratories are accredited by the United Kingdom Accreditation Service (UKAS) as meeting the requirements of ISO 17025. Food Contact Migration Testing to EC requirements is included in the list of accredited tests.

  
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Reason: Signed on behalf of Y. Kilgallon

Y. Kilgallon  
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