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**Hypherion Corporation  
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# **Biodegradability of Decon Shield**

**July 2005**

Prepared By



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# 1 EXECUTIVE SUMMARY

Hypherion Corporation has developed a decontamination product called Decon Shield. An assessment of the environmental profile of Decon Shield by evaluating biodegradability has been completed.

Decon Shield has rapid and excellent biodegradability:

- A maximum degradation achieved on average was 95% during the test period. Generally a substance with greater than 70% decomposition within 28 days is classified as having excellent biodegradability.; and
- The degradation time is rapid and is estimated at around four days. There is also a short lag time estimated at approximately two days.

Decon Shield is applied to a surface to effect decontamination. Typically after Decon Shield has been applied to a particular task it would be rinsed away from the surface and then enter the environment. Decon Shield can be expected to have a low environmental impact based on biodegradability.

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## 2 INTRODUCTION

Cetec Pty Ltd is an independent organisation that, through its Foray Laboratories Pty. Ltd., has a National Association of Testing Authorities, Australia (NATA) ISO/IEC 17025 accredited laboratory capable of testing and evaluating a wide variety of products and materials.

Hypherion Corporation is a Research and Development – Commercialisation Company that has developed an innovative decontamination product called Decon Shield. Decon Shield has been investigated for potential applications such as neutralising biological warfare and chemical warfare agents.

Hypherion Corporation requested Cetec characterise the environmental performance of Decon Shield through biodegradability testing. Typically after Decon Shield has been applied to a particular task it would be rinsed away from a surface and enter the environment. As a consequence the environmental impact of Decon Shield must be evaluated. Biodegradability is the ability of a substance to be broken down into simpler substances (e.g. carbon dioxide) by bacteria.

### 3 METHODOLOGY

Biodegradability testing was done as per ISO Standard 10707 “Water Quality – Evaluation in an Aqueous Medium of the Ultimate Aerobic Biodegradability of Organic Compounds – Method by Analysis of Biochemical Oxygen Demand (Closed Bottle Test)”.

The method involves a solution of the organic test compound in a mineral medium as the sole source of carbon and energy that is inoculated with micro-organisms and kept in completely full, closed bottles in the dark at a constant temperature. Biodegradation is followed by analysis of dissolved oxygen over a period of 28 days. Biodegradation is calculated from the amount of oxygen taken up by the test chemical (biochemical oxygen demand – BOD), corrected for uptake by the blank inoculum run in parallel, and expressed as a percentage of chemical oxygen demand (COD).

Trials were done first to establish the suitable concentration of test compound to use and the optimum pre-conditioning and volume of inoculum to use.

The test conditions included:

1. Decon Shield as the test compound prepared by mixing one part A and one part B with 18 parts distilled water. This material was used to determine the COD. The concentration in the biodegradability test was 5mg/L. Sodium acetate was the reference compound.
2. Inoculum was obtained from the secondary effluent stage of a water treatment plant and aerated for 24 hours before being used in the test.
3. Blank, test compound and reference compound BOD bottles were prepared in triplicate.
4. BOD bottles kept in the dark at  $20\pm 1^{\circ}\text{C}$  during the entire test period.
5. A time intervals comprising 0, 3, 5, 7, 14, 21 and 28 days BOD bottles were selected for measurement of dissolved oxygen using an electrochemical probe.
6. Percent biodegradability was calculated using equation 1 listed in the ISO Standard 10707.

## 4 RESULTS

Figure 1 shows the biodegradability curve for Decon Shield with biodegradability parameters listed in Table 1.

The time from the beginning of inoculation until the degradation percentage has increased to ca. 10% COD, called the lag time, was less than two days.

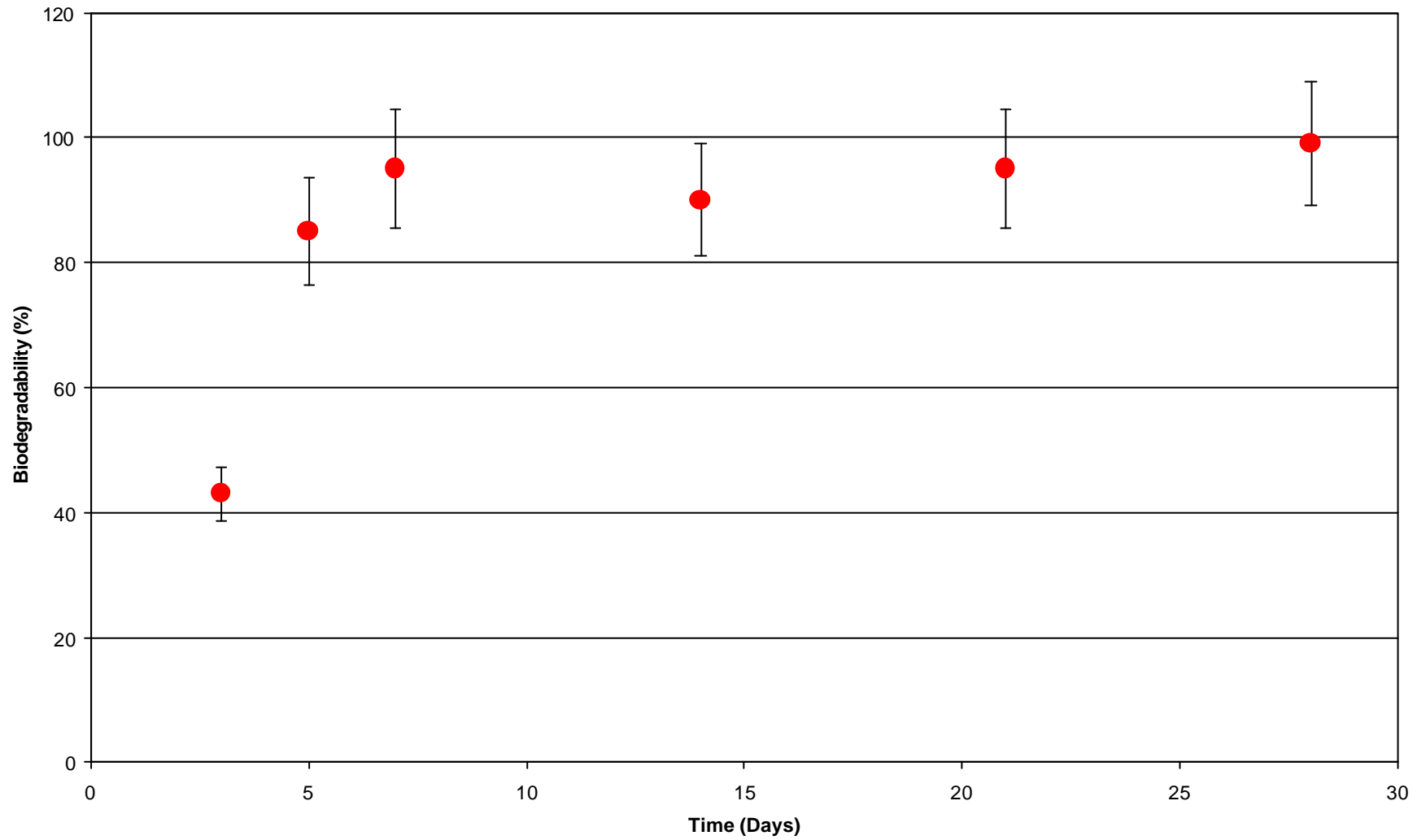
The maximum degradation achieved on average was 95%.

The time from the end of the lag time till the time that about 90% of the maximum level of degradation had been reached, called the degradation time, was estimated at four days.

**Table 1: Biodegradability Parameters for Decon Shield**

Parameter	Value
COD	47000 mg/L
Lag Time	< 2 days (estimated)
Maximum Degradation	95%
Degradation Time	4 days (estimated)

Typically a substance with greater than 70% decomposition is classified as having excellent biodegradability and hence low environmental impact. Decon Shield has both rapid and excellent biodegradability.



**Figure 1: Biodegradability curve for Decon Shield.**

## 5 CONCLUSION

An assessment of the environmental profile of the decontamination product Decon Shield by evaluating biodegradability has been conducted. Decon Shield has rapid and excellent biodegradability:

- A maximum degradation achieved on average was 95% during the test period. Generally a substance with greater than 70% decomposition within 28 days is classified as having excellent biodegradability; and
- The degradation time is rapid and is estimated at around four days. There is also a short lag time estimated at approximately two days.

Decon Shield is applied to a surface to effect decontamination. Typically after Decon Shield has been applied to a particular task it would be rinsed away from the surface and then enter the environment. Decon Shield can be expected to have a low environmental impact.



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