Ready Biodegradability Test by Manometric Respirometry Method

Introduction

Complete biodegradation of a xenobiotic is a critical natural process for ensuring safe environment. The residual xenobiotic substances may have access to the surface waters through diverse pathways, including direct exposure, spray drift, flowingwater/rain runoff, drainage, waste disposal, and effluent from industrial, domestic, or agricultural sources. The AquaticBiodegradation test is aimed at assessing the potential aquatic aerobic biodegradation of the test chemicals. This assessmentaids in reducing the environmental impact of chemicals present in the ecosystem, ensuring their transformation into less harmful substances.

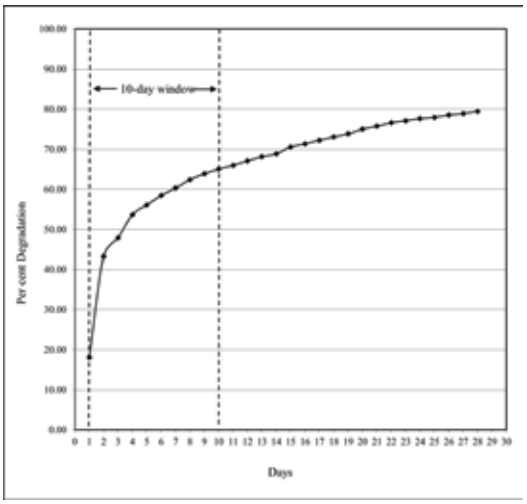
Brief Description of the Test Method

The sodium benzoate was used as a test item to confirm the validity of test. A fresh sample of activated sludge from aeration tank of sewage treatment plant was collected and used as inoculum. The mineral medium was prepared following proceduredefined by the test guideline. The sludge sample was washed three times by centrifuge and resuspension in mineralmedia. The suspended solids level in sludge was determined and the required volume of washed sludge was suspended inmineral media to yield a concentration of 4 g suspended solids/L. The sludge was pre-conditioned by aerating at 22 ± 2 °C for 6 days and analysed for microbial count and confirmed to ensure 1.4×10^8 CFU/L of the test matrix. The test suspension in mineral medium was prepared equivalent to a concentration of 100 mg/L using stock solution. Similarly, inoculum blank was prepared but without test item. An appropriate volume of the prepared activated sludge was added to achievea concentration of suspended solids of not more than 30 mg/L and the pH value was determined and adjusted to 7.4±0.2.The required volume of test suspension and blank control was added into respective respirometer flasks in duplicate. The soda-lime pellets were added to the CO^2 absorber compartments. The test flasks were allowed to reach desired temperature 22±2 °C. An automatic respirometer was assembled and initiated the stirring, confirming that each bottle was sealed air-tight. Then oxygen uptake measurement was started. A daily record of oxygen uptake wasb obtained so that the 10-d window can easily be identified.

Results

The test results passed all the validity criteria defined by the test as mentioned

- The oxygen uptake of the inoculum blank was below 60 mg/L over a period of 28 days.
- The difference of extremes of replicate values for the removal of test item at the end of the test were less than 20%.
- The pH value of the test item was between 6 and 8.5.
- The test item achieved 60% biodegradation within the 10-day period (the 10 days following the attainment of 10% biodegradation of the test item).



Conclusion

The percentage of biodegradation established that Sodium Benzoate was highly biodegradable. The findings of the current study fulfil all the criteria specified by the testing guidelines under the conditions of our testing facility.

References

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About the author

Arun Raithatha, M. Sc. (Chemistry) is a serving senior scientist in the Department of Environmental Fate and Metabolism at Jai Research Foundation. For over 25 years in industry, Arun has a vivid experience, viz., leadership, training, designing, conducting, and reporting of environmental fate studies. He is an a dept in conducting a higher tier metabolism, biodegradation, sorption studies and identifying key metabolitesusing 12C and 14C test compounds, as per the GLP requirement, for the registration of a compound under OECD, EPA, and EU. He has participated in training conducted at the Bhabha Atomic Research Centre (BARC) on the use and handling of radioactive substances in the field of research and he is a certified Radiological Safety Officer.

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