

SGS INSTITUT FRESENIUS GmbH · Im Maisel 14 · D-65232 Taunusstein

Ruehe ecoClean GmbH
Rudolf-Breitscheid-Str. 162
14482 Potsdam

Report-No.: 6333685-02-V1

SGS INSTITUT FRESENIUS GmbH
Im Maisel 14
D-65232 Taunusstein

Anna-Magdalena Eigenbrodt
Health & Nutrition
Cosmetics & Hygiene – BioServices
Tel. +49 6128 744 566
anna-magdalena.eigenbrodt@sgs.com

Taunusstein, November 30, 2022

1 General Information

Title:	Test for Ready Biodegradability of Products
Sponsor:	Ruehe ecoClean GmbH
Sponsor's contact person:	Andre Nanda
SGS contact person:	Anna-Magdalena Eigenbrodt
Sample designation:	SOLVIS eco power Universalreiniger
Sample characterization:	clear, transparent liquid
SGS Sample-No.:	221042100
Date of order:	September 21, 2022
Sample receipt:	September 21, 2022
Test method:	OECD-Guideline 301 F (Manometric Respirometry Test) 1992-07; accredited to DIN EN ISO 17025
Testing period:	October 12, 2022 to November 9, 2022
Pages:	6

This test report is a second report for Sample-No 221042100. The test report 6333685-01-V1, provided on November 30, 2022, serves as basis for this second report.

2 Test Information

Inoculum:	Filtrate of homogenised activated sludge from the waste-water treatment plant at Taunusstein-Bleidenstadt; Lot-No.: October 12, 2022
Incubation time:	28 days
Detection method:	measurement of oxygen consumption
Control:	Sodium benzoate, ≈ 100 mg/L

3 Method description

Approximately 100 mg of the test item and a predetermined amount of microorganisms derived from a municipal sewage treatment plant representing ≈ 30 mg dry matter are incubated together in a mineral nutrient medium for 28d in special incubation vessels of a respirometer (*SAPROMAT*). The incubation takes place in the dark at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ of constant temperature. Upon biochemical processes in the test solutions the test item is oxidised and oxygen in the liquid is consumed. Oxygen in the space above the liquid phase is dissolved in the liquid, resulting in generation of CO_2 (from carbon material of the test item) in its place. As this CO_2 is absorbed by soda lime, the partial pressure of oxygen in the space and the total pressure decrease. The drop in pressure is detected and converted into an electric signal generating electrolytic oxygen from sulphuric acid copper solution contained in an electrolytic bottle by constant current. This oxygen is supplied to the cultivating bottle and restoration of pressure is detected by means of the manometer, resulting in switching off the relay circuit and stopping the electrolytic process. Thus, the upper space in the cultivating bottle is always kept under a constant pressure of oxygen and the quantity of oxygen consumed in the cultivating bottle is proportional to the quantity of electrolytic oxygen. So the oxygen uptake can be read directly from the manometer. Additionally the oxygen-uptake is recorded automatically by a recorder.

Two Blank solutions with inoculum, but without any test item were run in parallel in order to determine the oxygen consumption of the inoculum. For determination of the activity of the inoculum one test solution with 100 mg sodium benzoate was tested in parallel, respectively. In order to determine a possible bacterial toxicity of the test item, one test solution with ≈ 100 mg test item **and** ≈ 100 mg sodium benzoate per litre of test solution was tested in parallel. If there was no bacterial toxicity the oxygen-uptake in this combined test solution should have been the same as the sum of both the oxygen-uptake of the test solutions with the test item alone (mean of two test solutions) **and** the test solution with sodium benzoate alone, respectively.

4 Evaluation

The biodegradability is calculated according to the measured BOD of the test- or control item and the calculated TOD (theoretical oxygen demand) of the control item and the measured COD of the test item.

$$\% \text{ Biodegradability} = \frac{\text{mg BOD}_x/\text{L}}{\text{mg AS/L} \times \text{TOD}} \times 100 \quad \text{where}$$

$\text{BOD}_x = \text{BOD}_{\text{TS}} - \text{BOD}_{\text{BW}}$ Biochemical oxygen demand at time t_x , where

$\text{BOD}_{\text{TS}} =$ biochemical oxygen demand (value read on the display of the respirometer, in mg O_2/L) in the test solution with the test- or control item at time t_x and

$\text{BOD}_{\text{BW}} =$ biochemical oxygen demand (value read on the display of the respirometer, in mg O_2/L) in the test solutions without any test item (Blank, mean of two test solutions)

$\text{AS/L} =$ Active substance (test item) per litre of test solution

$\text{COD} =$ Chemical Oxygen Demand (mg O_2/mg of test- or control item)

5 Test report

The test solutions were prepared according to OECD-Guideline 301 F, Manometric Respirometry Test.

Chemical Oxygen Demand (COD) of the test item: 116 mg O_2/g test item

Amount of test item in the test solution 1: 1102.8 mg/L
Calculated TOD in the test solution 1: 127.9 mg O_2/L

Amount of test item in the test solution 2: 1108.4 mg/L
Calculated TOD in the test solution 2: 128.6 mg O_2/L

Amount of the control item sodium benzoate: 106.2 mg/L (solution 3)
Calculated TOD in the test solution 3: 171.7 mg O_2/L

Amount of test item in the toxicity control: 1120.8 mg/L (solution 4)
Amount of sodium benzoate in the toxicity control: 113 mg/L (solution 4)
Calculated TOD in the test solution 4: 312.7 mg O_2/L

6 Validity criteria

Positive Control:

The control item sodium benzoate was degraded 100 % within 28 days. The threshold of "ready biodegradability" of ≥ 60 % was passed within 5 days (65 %).

The validity criteria defined by guideline OECD 301 F were met / complied with:

- The positive control meets the requirements with regard to the minimum degree of degradation and a 10-day window.
- The result deviation in the parallel batches with test substance (Run 1 and 2) is < 20 %.

7 Results

Table 1: Summary of results

Time (d)	% Degradation				
	Positive Control	Toxicity Control	Test Item, 1st Treatment	Test Item, 2nd Treatment	Total Mean, Test Item
0	0	0	0	0	0
1	11	9	2	4	3
2	29	18	15	16	16
3	34	21	17	18	17
4	46	27	19	20	20
5	65	32	21	22	21
6	79	36	22	23	23
7	82	54	24	25	24
8	84	56	26	28	27
9	86	57	30	37	34
10	88	59	35	48	42
11	90	60	40	55	48
12	91	61	45	60	52
13	93	62	49	61	55
14	94	63	52	62	57
15	94	64	55	63	59
16	95	64	57	63	60
17	96	65	59	64	61
18	96	66	60	64	62
19	97	67	61	64	63
20	97	67	62	65	63
21	98	68	63	65	64
22	98	68	63	65	64
23	98	68	64	65	65
24	99	69	65	66	65
25	99	69	65	66	66
26	99	70	66	66	66
27	99	70	66	67	66
28	100	73	66	67	67

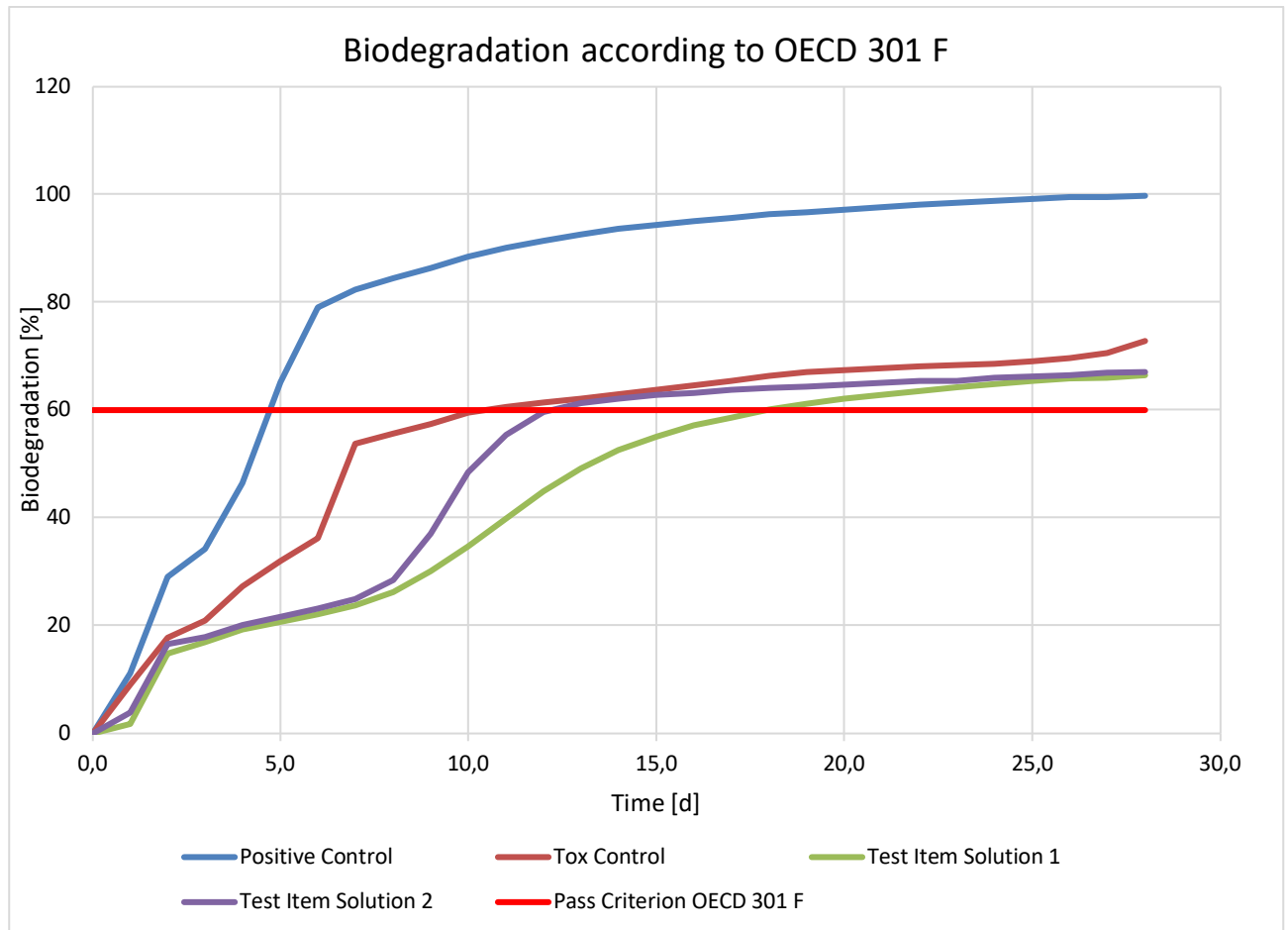


Figure 1: Graphical Presentation of the Results

8 Conclusion

The threshold of "ready biodegradability" of $\geq 60\%$ was met within both test solutions. The mean value of 67% is higher than the pass value of the OECD Guideline 301F. Thus, the test item **SOLVIS eco power Universalreiniger** can be termed "readily biodegradable".

According to the results of the toxicity control, a toxic effect towards microorganisms at the concentration tested can be excluded.

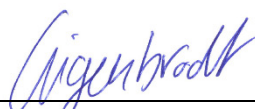
Annotation I: Biodegradation values slightly below of the threshold value for "ready biodegradability" of 60% may be interpreted as "inherently biodegradable" as outlined in the "Revised Introduction to the OECD Guidelines for testing of Chemicals, section 3, Part 1" dated 23 March 2006.

Annotation: It should be noted that the bio degradation test method according to OECD 301F was designed to test pure substances, but not for multi-substance mixtures. Therefore, it cannot be excluded that individual product components or degradation (intermediate) products / metabolites are ready degradable, inherent degradable and / or non-degradable, as this guideline only detects the sum of the mineralized organic carbon compounds.

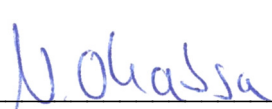
SGS Institut Fresenius GmbH

D-65232 Taunusstein, November 30, 2022

i.V.


 Anna-Magdalena Eigenbrodt
 Customer Service Consultant BioServices

i.A.


 Nicole Okabsa
 Team Assistant BioServices

The test results refer exclusively to the examined test items and the date of the test under the test specifications

-End of Report-

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