

## Customer Report

Monday, January 04, 2016

C  
O  
N  
T  
A  
C  
T

**Globe Industries Ltd.**

Bul.6-th September 222A

4000 Plovdiv

Bulgaria

BG160059125

**Plamen Dimitrov**

### Project Title

Antimicrobial Test

ID

**1015-BPT-01 -- 3**

Entry Date 12/2/2015

### Project Summary

The **ASTM G21** method provides an assessment for fungal resistance of a test material. The test sample is inoculated with a mixed fungal spore inoculum that contains commonly found fungi that are known to contaminate synthetic and natural materials. The test result rating is based on a visual score of 0 to 4 (4 being the worst and indicating greater than 60% coverage of the sample by growing fungi).

Depending on the test results, sample notes may include the presence or absence of the zone of inhibition (ZOI in mm) or contact inhibition, both indicating the effect on fungal growth on the nutrient plate due to the presence of the test sample. In addition, following initial visual assessments for fungal growth, confirmation is determined by microscopic examination of the test samples.

#### **Recommended Reading**

Online Resource for Product Development, Testing, and Inquiry; **The Wily Microbe**

*Antimicrobial preservation*

<http://wily-microbe.situbiosciences.com/15-microbial-control/>

<http://wily-microbe.situbiosciences.com/34-microbial-control-testing/>

*Antimicrobial testing with textiles and consumer products*

<http://wily-microbe.situbiosciences.com/280-textile-testing-antimicrobials/>

## Sample List

### Method Name

*Sample #*

*Sample Name*

*Sample Notes*

ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

- |   |                   |
|---|-------------------|
| 1 | T25/45 cinnamon   |
| 2 | T25/45 zeolite    |
| 3 | Untreated Control |

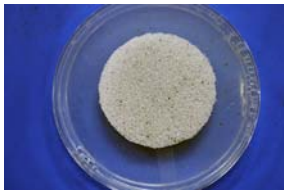
# Result Table

Contact	Globe Industries Ltd.	Plamen Dimitrov
Title	Antimicrobial Test	
Project ID	<b>1015-BPT-01 -- 3</b>	Entry Date 12/2/2015      Test Start Date 12/2/2015

## Result Table \*


<b>Test Method</b>	ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi	
--------------------	--	--

<b>Sample #</b>	<b>1</b>	T25/45 cinnamon
-----------------	----------	-----------------

	Interval	Result
<b>Inoculum</b> <i>Mixed Fungal Cultures ()</i>		
<small>Notes Section</small>		
<5% coverage by fungal mycelia and spore	28 day	1 0 to 4 (4 is poor)
<i>Image:</i> sample		

<b>Test Method</b>	ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi	
--------------------	--	--

<b>Sample #</b>	<b>2</b>	T25/45 zeolite
-----------------	----------	----------------

	Interval	Result
<b>Inoculum</b> <i>Mixed Fungal Cultures ()</i>		
<small>Notes Section</small>		
no fungal growth; no contact inhibition	28 day	0 0 to 4 (4 is poor)
<i>Image:</i> sample		

# Result Table \*

Test Method

ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Sample # **3** Untreated Control

Interval

Result

Inoculum *Mixed Fungal Cultures ()*

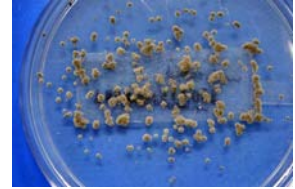
Notes Section

>90% coverage by fungal mycelia and spore

28 day

4 0 to 4 (4 is poor)

Image: control



### ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

#### Method Conventions

The ASTM G21 is a qualitative antimicrobial test used to detect general fungi static activity on materials. This antimicrobial testing method is useful for obtaining an estimate of activity by demonstration of a zone of growth inhibition around or in contact with an effectively treated article. The size of the zone of inhibition is not a predictive factor for any other antimicrobial attribute. Test results are reported as a number based on a rating scale of 0 to 4 and notes are provided if a zone of inhibition or contact inhibition is present. If there is no zone present but there is contact inhibition of fungal growth with the treated article, the item will achieve a score of 0.

#### Organisms Tested (unless noted)

**Aspergillus niger** ATCC 9642

**Penicillium pinophilum** ATCC 11797

**Chaetomium globosum** ATCC 6205

**Trichoderma virens** ATCC 9645

**Aureobasidium pullulans** ATCC 15233

#### Terminology

**activity**, n..of an antimicrobial agent, a measure of effectiveness of the agent.

**antimicrobial agent**, n..in textiles, any chemical which kills (for example) bacteria or fungi (bactericide or fungicide) or interferes with microorganism growth.

**zone of inhibition (ZOI)** – the average measure of the distance from the edge of the article to the boundary where microorganism growth begins.

**contact or no contact, inhibition (CI or NCI)** - when no fungal growth is recorded on the surface of the sample, there may be growth of fungi at the interface between the test plate and the test sample. In these instances CI or NCI may be indicated to provide additional information on the performance of anti-fungal material at this interface. This determination is **not** part of the standard method but is provided as guidance for development or comparison of the test material.

**Untreated Control (UTC)** - untreated control sample material used to demonstrate normal test performance, showing robust microorganism growth.

**Interval** - represents the point or time point from which the result value was determined; T0 indicates that the result is from the soonest possible time from inoculation to recovery of the inoculated sample (typically < 5min).

**Result** - the result is the measure of change or abundance. Result units indicate the actual measurements, frequently relative to a control value depending on the method or test requirements.

#### Fungal growth rating in this report.

0 - no fungal growth

1 - Trace growth (< 10% coverage)

2 - Light growth (10% to 30% coverage)

3 - Medium growth (30% to 60% coverage)

4 - Heavy growth (~ 60% to complete coverage)

---

\* This report is governed by and incorporates by reference, the conditions of testing as posted on the date of issuance and is intended for your exclusive use. Any Copying or replication of this report to or for any other person or entity, or use of our company name or Service Mark is permitted only with our prior written consent. All images supplied as part of the report are the sole property of Situ Biosciences LLC and are copyright protected; unless provided as explicitly identified components of the project invoice. This report sets forth our findings solely with respect to test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar identical product unless specifically and expressly noted. Our report includes all tests requested and the results there of based upon the information provided. You have 60 days from the date of issuance of this report to notify us of any material error or omission caused by our handling of the samples, provided however that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the test conducted and the correctness of the report contents.

---

*d p satchell Ph.D.*  
Technology Director

# Report Addendum

Monday, January 04, 2016

Project ID **1015-BPT-01 -- 3**

Entry Date 12/2/2015

Test Start Date 12/2/2015

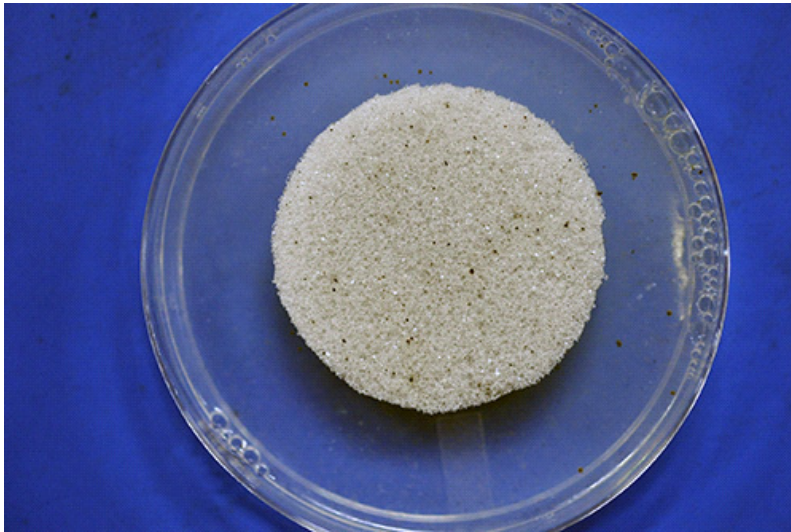
## Image Table

Sample # **1** T25/45 cinnamon

Test Method ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Inoculum *Mixed Fungal Cultures*

Image: sample

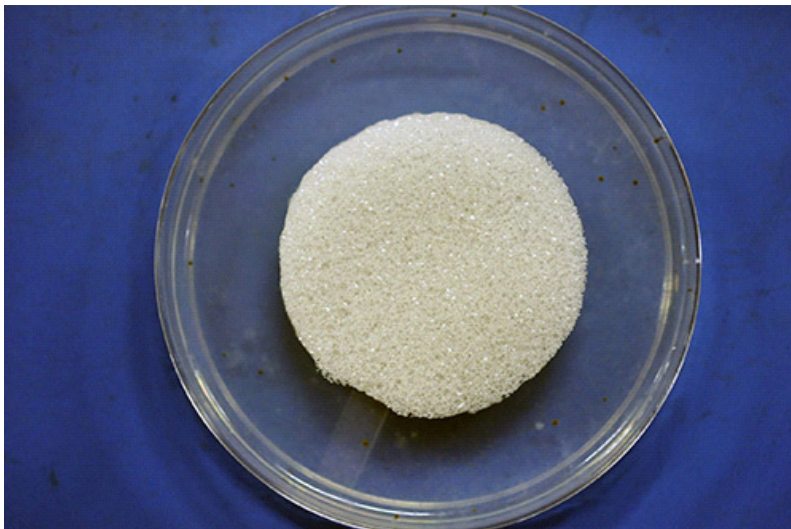


Sample # **2** T25/45 zeolite

Test Method ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Inoculum *Mixed Fungal Cultures*

Image: sample



## Image Table

Sample # 3 Untreated Control

Test Method ASTM G21 - 09 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Inoculum *Mixed Fungal Cultures*

Image: control

