



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

TECHNICAL REPORT

PREPARED FOR GRANITIFIANDRE-STONEPEAK CERAMICS
BY TILE COUNCIL OF NORTH AMERICA, INC.

CONFIDENTIAL

Testing Services: testing@tileusa.com Literature Orders: literature@tileusa.com Web Site: www.tileusa.com

This report is confidential and has been prepared for the exclusive use of the client. It is not an endorsement, approval, certification, or criticism of any product by TCNA. This report shall not be published in any form without prior written consent from TCNA.



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

June 16, 2010

GranitiFiandre Spa
Via Radici Nord, 112
42014 Castellarano RE – Italy

StonePeak Ceramics, Inc.
314 W. Superior St.,
Chicago, IL 60654 – USA

Dear Mr. Verdi:

Please find herein Tile Council of North America's official laboratory report assessing effects of photocatalytic activity on bacteria using tile samples supplied by GranitiFiandre using test protocol ISO 27447. If you have any questions or require clarification on any of the methods, materials or interpretation of results, please feel free to contact our laboratory. We would be glad to discuss any specifics with you or your designated agents.

It has been a pleasure to work with you on this project. On behalf of our staff, we thank you for the opportunity to provide these testing services to you.

Sincerely,

Claudio Bizzaglia
Director of Laboratory Services

Jennifer J. Ariss, PhD
Research and Standards
Development Scientist



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER: TCNA-097-10 **PAGE:** 1 OF 13

TEST REQUESTED BY: **GranitiFiandre Spa** **StonePeak Ceramics, Inc.**
Via Radici Nord, 112 314 W. Superior St.,
42014 Castellarano RE – Italy Chicago, IL 60654 – USA

TEST SUBJECT MATERIAL: Test materials identified by client as:
“White Ground Pre.Active PF3236PA” and
“White Ground Active PFAP3236”
Test materials received: 03/23/2010
Received as: 60 cm × 30 cm tiles

TEST DATE: 04/06/2010 – 04/25/2010

TEST PROCEDURE: ISO 27447: Test method for antibacterial activity of semiconducting photocatalytic materials

TEST CONDITIONS: Test sample: 50 mm × 50 mm square, 9 mm thick
Sample pre-exposure: None
Test bacteria: *E. coli* ATCC 8739
S. aureus ATCC 3538P
K. pneumoniae ATCC 4352
UV lamp: Interlight F40 T10/BLB 130V 40W
UV light radiometer: Mannix UV340
UV light exposure: 8 hrs
Irradiation intensity: 0.25mW/cm²



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 2 OF 13

TEST RESULTS: Test 1 - *E. coli*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**		
Control – 0hrs	1.06 × 10 ⁵	1.16 × 10 ⁵				
	1.26 × 10 ⁵					
	1.03 × 10 ⁵	0.83 × 10 ⁵				
	0.62 × 10 ⁵					
Control – Dark	0.92 × 10 ⁵	1.46 × 10 ⁴				
	1.07 × 10 ⁵					
	1.74 × 10 ⁵	1.68 × 10 ⁵				
	1.61 × 10 ⁵					
1.46 × 10 ⁵	1.54 × 10 ⁵					
1.62 × 10 ⁵						
Control – UV	1.03 × 10 ⁵	1.46 × 10 ⁵				
	1.26 × 10 ⁵					
	1.35 × 10 ⁴	1.24 × 10 ⁴				
	1.12 × 10 ⁴					
0.89 × 10 ⁴	0.95 × 10 ⁴					
1.00 × 10 ⁴						
Active – Dark	0.98 × 10 ⁴	1.03 × 10 ⁴				
	1.07 × 10 ⁴					
	1.62 × 10 ⁴	1.59 × 10 ⁴				
	1.55 × 10 ⁴					
1.49 × 10 ⁴	1.27 × 10 ⁴					
1.04 × 10 ⁴						
Active – UV	1.33 × 10 ⁴	1.37 × 10 ⁴	0%	100%		
	1.40 × 10 ⁴					
	0	0			0%	100%
	0					
0	0	0%	100%			
0						

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 3 OF 13

TEST RESULTS CONTINUED: Test 1 - *S. aureus*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**
Control – 0hrs	1.42 × 10 ⁵ 1.37 × 10 ⁵	1.40 × 10 ⁵		
	1.44 × 10 ⁵ 1.37 × 10 ⁵	1.41 × 10 ⁵		
	1.38 × 10 ⁵ 1.46 × 10 ⁵	1.41 × 10 ⁵		
Control – Dark	1.92 × 10 ⁵ 2.02 × 10 ⁵	1.97 × 10 ⁵		
	2.31 × 10 ⁵ 2.17 × 10 ⁵	2.24 × 10 ⁵		
	2.22 × 10 ⁵ 2.11 × 10 ⁵	2.17 × 10 ⁵		
Control – UV	1.10 × 10 ⁴ 1.29 × 10 ⁴	1.20 × 10 ⁴		
	1.04 × 10 ⁴ 1.21 × 10 ⁴	1.13 × 10 ³		
	1.19 × 10 ⁴ 1.01 × 10 ⁴	1.10 × 10 ⁴		
Active – Dark	1.14 × 10 ⁴ 1.20 × 10 ⁴	1.17 × 10 ⁴		
	1.28 × 10 ⁴ 1.17 × 10 ⁴	1.23 × 10 ⁴		
	1.40 × 10 ⁴ 1.22 × 10 ⁴	1.31 × 10 ⁴		
Active – UV	0 0	0	0%	100%
	0 0	0	0%	100%
	0 0	0	0%	100%

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 4 OF 13

TEST RESULTS CONTINUED: Test1 - *K. pneumoniae*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**		
Control – 0hrs	2.90 × 10 ⁵	3.60 × 10 ⁵				
	4.30 × 10 ⁵					
	4.60 × 10 ⁵	5.30 × 10 ⁵				
	6.00 × 10 ⁵					
Control - Dark	5.40 × 10 ⁵	5.80 × 10 ⁵				
	6.20 × 10 ⁵					
	6.20 × 10 ⁴	6.30 × 10 ⁴				
	6.40 × 10 ⁴					
4.20 × 10 ⁴	5.00 × 10 ⁴					
5.80 × 10 ⁴						
Control – UV	7.30 × 10 ⁴			6.90 × 10 ⁴		
	6.50 × 10 ⁴					
	1.89 × 10 ⁴	1.95 × 10 ⁴				
	2.00 × 10 ⁴					
1.96 × 10 ⁴	1.93 × 10 ⁴					
1.90 × 10 ⁴						
Active – Dark	1.84 × 10 ⁴		1.89 × 10 ⁴			
	1.93 × 10 ⁴					
	3.50 × 10 ⁴	5.70 × 10 ⁴				
	7.90 × 10 ⁴					
8.30 × 10 ⁴	7.50 × 10 ⁴					
6.70 × 10 ⁴						
Active – UV	8.50 × 10 ⁴		8.40 × 10 ⁴		0%	100%
	8.30 × 10 ⁴					
	0	0	0%	100%		
	0					
0	0	0%	100%			
0						

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

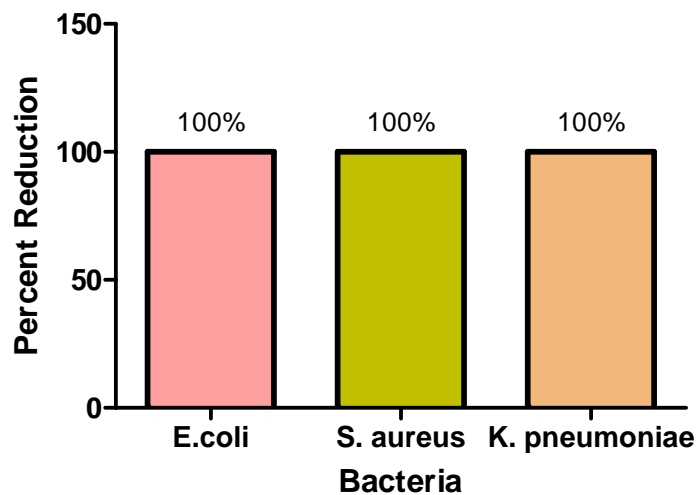
REPORT NUMBER:

TCNA-097-10

PAGE: 5 OF 13

TEST RESULTS CONTINUED:

Test 1: Percent reduction of bacteria on photocatalytic test samples



**Results are presented in the format of percent of surviving bacteria compared to inoculated non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 6 OF 13

TEST RESULTS CONTINUED: Test 2 - *E. coli*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**
Control – 0hrs	7.50 × 10 ⁵ 6.60 × 10 ⁵	7.05 × 10 ⁵		
	7.40 × 10 ⁵ 6.90 × 10 ⁵	7.15 × 10 ⁵		
	7.10 × 10 ⁵ 6.60 × 10 ⁵	6.85 × 10 ⁵		
Control – Dark	1.92 × 10 ⁵ 1.96 × 10 ⁵	1.94 × 10 ⁵		
	1.87 × 10 ⁵ 1.92 × 10 ⁵	1.90 × 10 ⁵		
	1.97 × 10 ⁵ 1.91 × 10 ⁵	1.94 × 10 ⁵		
Control – UV	3.00 × 10 ⁴ 4.20 × 10 ⁴	3.60 × 10 ⁴		
	2.79 × 10 ⁴ 2.91 × 10 ⁴	2.85 × 10 ⁴		
	2.82 × 10 ⁴ 2.69 × 10 ⁴	2.76 × 10 ⁴		
Active – Dark	1.10 × 10 ⁵ 1.25 × 10 ⁵	1.18 × 10 ⁵		
	1.09 × 10 ⁵ 1.18 × 10 ⁵	1.14 × 10 ⁵		
	1.22 × 10 ⁵ 1.17 × 10 ⁵	1.20 × 10 ⁵		
Active – UV	0 0	0	0%	100%
	0 0	0	0%	100%
	0 0	0	0%	100%

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 7 OF 13

TEST RESULTS CONTINUED: Test 2 - *S. aureus*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**
Control – 0hrs	1.20 × 10 ⁵	1.23 × 10 ⁵		
	1.26 × 10 ⁵			
	1.49 × 10 ⁵	1.56 × 10 ⁵		
	1.62 × 10 ⁵			
Control – dark	1.03 × 10 ⁵	1.46 × 10 ⁵		
	1.88 × 10 ⁵			
	1.39 × 10 ⁵	1.33 × 10 ⁵		
	1.27 × 10 ⁵			
Control – UV	1.55 × 10 ⁵	1.43 × 10 ⁵		
	1.31 × 10 ⁵			
	1.04 × 10 ⁵	1.00 × 10 ⁵		
	0.96 × 10 ⁵			
Active – Dark	1.78 × 10 ⁴	1.66 × 10 ⁴		
	1.53 × 10 ⁴			
	1.82 × 10 ⁴	1.64 × 10 ⁴		
	1.46 × 10 ⁴			
Active – Dark	2.00 × 10 ⁴	2.06 × 10 ⁴		
	2.11 × 10 ⁴			
	1.67 × 10 ⁴	1.58 × 10 ⁴		
	1.48 × 10 ⁴			
Active – UV	1.91 × 10 ⁴	1.77 × 10 ⁴	0%	100%
	1.63 × 10 ⁴			
	1.77 × 10 ⁴	1.71 × 10 ⁴		
	1.64 × 10 ⁴			
Active – UV	0	0	0%	100%
	0			
	0	0		
	0			

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 8 OF 13

TEST RESULTS CONTINUED: Test 2 - *K. pneumoniae*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**
Control – 0hrs	2.80 × 10 ⁵ 2.70 × 10 ⁵	2.75 × 10 ⁵		
	3.10 × 10 ⁵ 3.40 × 10 ⁵	3.25 × 10 ⁵		
	2.74 × 10 ⁵ 2.92 × 10 ⁵	2.83 × 10 ⁵		
Control – Dark	1.21 × 10 ⁵ 1.10 × 10 ⁵	1.16 × 10 ⁵		
	1.41 × 10 ⁵ 1.34 × 10 ⁵	1.38 × 10 ⁵		
	1.38 × 10 ⁵ 1.29 × 10 ⁵	1.34 × 10 ⁵		
Control – UV	1.42 × 10 ⁴ 1.50 × 10 ⁴	1.46 × 10 ⁴		
	1.21 × 10 ⁴ 1.44 × 10 ⁴	1.33 × 10 ⁴		
	1.59 × 10 ⁴ 1.43 × 10 ⁴	1.51 × 10 ⁴		
Active – Dark	1.48 × 10 ⁴ 1.61 × 10 ⁴	1.55 × 10 ⁴		
	1.00 × 10 ⁴ 1.07 × 10 ⁴	1.04 × 10 ⁴		
	1.52 × 10 ⁴ 1.32 × 10 ⁴	1.43 × 10 ⁴		
Active – UV	0 0	0	0%	100%
	0 0	0	0%	100%
	0 0	0	0%	100%

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

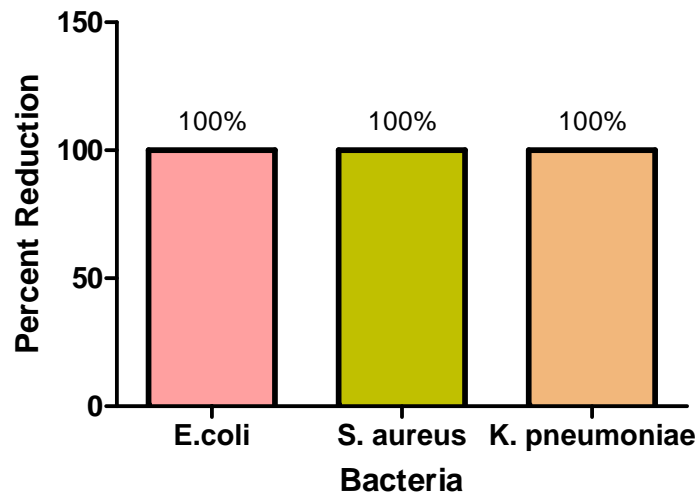
REPORT NUMBER:

TCNA-097-10

PAGE: 9 OF 13

TEST RESULTS CONTINUED:

Test 2: Percent reduction of bacteria on photocatalytic test samples



**Results are presented in the format of percent of surviving bacteria compared to inoculated non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 10 OF 13

TEST RESULTS CONTINUED: Test 3 - *E. coli*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**		
Control – 0hrs	1.38 × 10 ⁵	1.27 × 10 ⁵				
	1.11 × 10 ⁵					
	1.08 × 10 ⁵	1.02 × 10 ⁵				
	0.96 × 10 ⁵					
Control – Dark	1.28 × 10 ⁵	1.15 × 10 ⁵				
	1.02 × 10 ⁵					
	4.30 × 10 ⁴	3.90 × 10 ⁴				
	3.50 × 10 ⁴					
3.10 × 10 ⁴	3.60 × 10 ⁴					
4.10 × 10 ⁴						
Control – UV	4.00 × 10 ⁴	4.10 × 10 ⁴				
	4.20 × 10 ⁴					
	3.20 × 10 ⁴	3.55 × 10 ⁴				
	3.90 × 10 ⁴					
2.89 × 10 ⁴	2.72 × 10 ⁴					
2.54 × 10 ⁴						
Active – Dark	2.74 × 10 ⁴	2.79 × 10 ⁴				
	2.84 × 10 ⁴					
	5.90 × 10 ⁴	6.30 × 10 ⁴				
	6.70 × 10 ⁴					
8.70 × 10 ⁴	7.35 × 10 ⁴					
6.00 × 10 ⁴						
Active – UV	6.80 × 10 ⁴	7.05 × 10 ⁴	0%	100%		
	7.30 × 10 ⁴					
	0	0			0%	100%
	0					
0	0	0%	100%			
0						

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 11 OF 13

TEST RESULTS CONTINUED: Test 3 - *S. aureus*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**
Control – 0hrs	2.81 × 10 ⁵ 2.53 × 10 ⁵	2.67 × 10 ⁵		
	2.44 × 10 ⁵ 2.68 × 10 ⁵	2.56 × 10 ⁵		
	3.70 × 10 ⁵ 3.30 × 10 ⁵	3.50 × 10 ⁵		
Control – Dark	1.05 × 10 ⁴ 0.95 × 10 ⁴	1.00 × 10 ⁴		
	1.24 × 10 ⁴ 1.24 × 10 ⁴	1.24 × 10 ⁴		
	1.13 × 10 ⁴ 1.07 × 10 ⁴	1.10 × 10 ⁴		
Control – UV	1.33 × 10 ⁴ 1.03 × 10 ⁴	1.18 × 10 ⁴		
	1.34 × 10 ⁴ 1.36 × 10 ⁴	1.35 × 10 ⁴		
	1.29 × 10 ⁴ 1.37 × 10 ⁴	1.33 × 10 ⁴		
Active – Dark	4.80 × 10 ⁴ 4.40 × 10 ⁴	4.60 × 10 ⁴		
	3.20 × 10 ⁴ 2.93 × 10 ⁴	3.07 × 10 ³		
	2.81 × 10 ⁴ 2.94 × 10 ⁴	2.88 × 10 ⁴		
Active – UV	0 0	0	0%	100%
	0 0	0	0%	100%
	0 0	0	0%	100%

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

REPORT NUMBER:

TCNA-097-10

PAGE: 12 OF 13

TEST RESULTS CONTINUED: Test 3 - *K. pneumoniae*

Tile Description	Count: Bacteria/mL (duplicates)*	Average Bacteria/mL recovered	Percent Recovery**	Percent Reduction**
Control – 0hrs	1.43 × 10 ⁵	1.50 × 10 ⁵		
	1.56 × 10 ⁵			
	1.66 × 10 ⁵	1.84 × 10 ⁴		
	2.02 × 10 ⁵			
Control – Dark	1.79 × 10 ⁵	1.85 × 10 ⁴		
	1.91 × 10 ⁵			
	2.83 × 10 ⁵	2.72 × 10 ⁴		
	2.61 × 10 ⁵			
Control – UV	2.44 × 10 ⁵	2.58 × 10 ⁴		
	2.71 × 10 ⁵			
	2.81 × 10 ⁵	2.60 × 10 ⁴		
	2.39 × 10 ⁵			
Active – Dark	2.64 × 10 ⁴	2.79 × 10 ⁴		
	2.93 × 10 ⁴			
	2.85 × 10 ⁴	2.61 × 10 ⁴		
	2.36 × 10 ⁴			
Active – UV	2.23 × 10 ⁴	2.33 × 10 ⁴	0%	100%
	2.42 × 10 ⁴			
	9.20 × 10 ³	9.60 × 10 ³		
	10.00 × 10 ³			
Active – Dark	6.80 × 10 ³	6.85 × 10 ³		
	6.90 × 10 ³			
	10.00 × 10 ³	11.00 × 10 ³		
	12.00 × 10 ³			
Active – UV	0		0%	100%
	0			
	0		0%	100%
	0			
Active – UV	0		0%	100%
	0			
	0		0%	100%
	0			

**Bacterial enumeration conducted in duplicate for each test specimen*

***Recovery and Reduction calculations based on the percent of surviving bacteria on photocatalytic test samples UV irradiated compared to non-photocatalytic test samples UV irradiated*



PRODUCT TESTING SERVICE

100 Clemson Research Blvd. Anderson, SC 29625 Tel (864) 646-TILE Fax (864) 646-2821

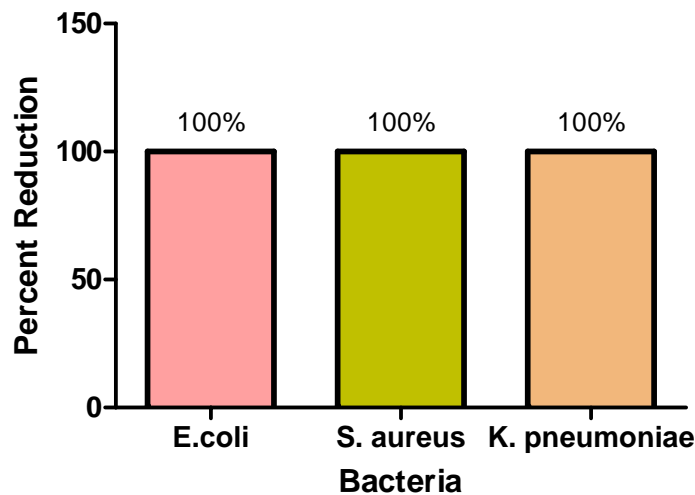
REPORT NUMBER:

TCNA-097-10

PAGE: 13 OF 13

TEST RESULTS CONTINUED:

Test 3: Percent reduction of bacteria on photocatalytic test samples



**Results are presented in the format of percent of surviving bacteria compared to inoculated non-photocatalytic test samples UV irradiated*

Prepared by:

Approved by:

Dr. Jyothi Rangineni
Research Scientist

June 16, 2010
Date

Dr. Jennifer Ariss
Research and Standards
Development Scientist

June 16, 2010
Date