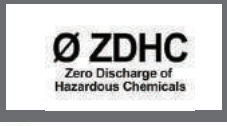
CERTIFICATE BOOK

Our Products are tested and certified from the following International Institutions.



CONTENTS

EDITORIAL

ABOUT NANOTECHNOLOGY PRODUCTS BY NANO4LIFE EUROPE L.P.®

NANO4LIFE EUROPE L.P.® was founded in 2008 in cooperation with leading Nanotechnology Institutes based in Germany to design and create our Nanotechnology products that are applied to all surfaces:

NANO4LIFE EUROPE L.P.® coatings have been created with Si02 (Silicone Dioxide Pure Quartz) utilizing the Sol-Gel process manufacturing to produce highly durable coatings that are completely safe, quick, renowned for ease of application and completely human and environmentally friendly.

NANO4LIFE EUROPE L.P.® in cooperation with A.I.A. is proud to present the new generation of nanotechnology most impressive range of products, the **NANODIAMOND** series.
The brand new **NANODIAMOND** just entered in our already vast range of innovative products from the best scientific laboratories in the world. This **NANODIAMOND** product series incorporate an ultra-high technology coating that protects with full coverage your vehicle paintwork from environment threatening and polluting factors.

In **NANO4LIFE EUROPE L.P.®** We have the largest range of Nanotechnology Products, offering up to 80 different products in up to 400 different packages from 10 ml to 1000 liters.

Surfaces treated with **NANO4LIFE EUROPE L.P.®** magically become Easy to Cleaning, super hydrophobic, durable and powerfully stain resistant on porous and non-porous surfaces alike without altering the breath- ability properties of the surfaces.

NANO4LIFE EUROPE L.P.® is an ISO9001:2008 certified company in the production of Nanotechnology products.

NANO4LIFE EUROPE L.P.® is the only company worldwide which has received from the HOHENSTEIN Textile Testing Institute GmbH & Co, the certificate ECO PASSPORT which confirms that our products meet the very strict specification Oeko-Tex Standart 100 product classes I-IV and can be used even in clothes that appeal to babies.

Also **NANO4LIFE EUROPE L.P.®** has received and has the most certificates of quality products from international Institutes in Germany , Spain , and also are certified from the Government organizations in Singapore N.E.A. (National Environmental Agency) , and in New Zealand E.P.A. (Environmental Protection Agency) that our products it is not hazardous for the environment.

NANO4LIFE EUROPE L.P.® provides full technical support including detailed brochures, specifications and video information that is made available.

NANO4LIFE EUROPE L.P.® products are in stock and can be delivered within 24 hours to any destination in the world. Delivery in European countries can be provided within 1 days and other points in the world in approximately 3 days with very low freight costs

BQC
Business Quality Certification

CERTIFICATE

BQC CERTIFICATION BODY CERTIFIES THAT THE COMPANY	**NANO4LIFE EUROPE L.P.** Vouliagmenis Ave. 318, Agios Dimitrios -17343, Athens, Greece
WITH SCOPE OF CERTIFICATION	Production and Distribution of Nanotechnology Products
HAS DEVELOPED AND IMPLEMENTS A QUALITY MANAGEMENT SYSTEM THAT FULLY MEETS THE REQUIREMENTS OF	**ISO 9001:2015**
AN AUDIT TOOK PLACE WITH REPORT NUMBER	6120
CERTIFICATE'S REGISTRATION NUMBER	100CN1817026120
THIS CERTIFICATE IS VALID FROM TO	22/06/2018 22/06/2021

Under the term of continuous conformity of the certified organization to the above standard and as long as the contractual terms are met and the annual surveillance audits are successfully conducted.

ATHENS, 22/06/2018

CERTIFICATION MANAGER

MS Certification
No. of Certificate 546

BQC is a registered trademark

CBA
Chemische Produkte-Beratung
und -Analyse GmbH

CBA GmbH, Konrad-Zuse-Straße 10, 66459 Kirkel-Limbach

info@cba-analytik.de
www.cba-analytik.de
Telefon: 06841 - 189 97 -0
Telefax: 06841 - 189 97 -17

NANO4LIFE EUROPE L.P.®
Vouliagmenis Ave. 318
Ag. Dimitrios - 173 43
Athens

Kirkel-Limbach, 15.02.2019

Analytical Report:

Internal project code:	336/12/18
Sample receipt date:	24.07.2017
Sample:	glass plates Sample 1: untreated (≙ Blank Sample (BS)) Sample 2: treated with "Nanodiamond Line"
Period of analysis:	21.12.2018 – 15.02.2019
Method Globalmigration/ Migration:	ASU B 80.30-6* (immersed) Migration with simulant A (10% ethanol), simulant B (3% acetic acid), simulant C (50% ethanol) Conditions: 10 days at 40 °C
Methode Screening for non-volatile substances:	GC-MS after extraction of the Migrate

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Geschäftsführung: Ingrid Graf, Holger Graf
Registergericht: Homburg HRB 3760, Steuer-Nr.: 075/107/00389, Ust-ID-Nr.: DE 138344417
Bankverbindung: Kreissparkasse Saarpfalz, IBAN: DE 25 594 500 10 10 10 664 504, BIC: SALADE 51 HOM

DAkkS Deutsche Akkreditierungsstelle D-PL-14360-01-00

CBA
Chemische Produkte-Beratung
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info@cba-analytik.de
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Ag. Dimitrios - 173 43
Athens

Kirkel-Limbach, 15.02.2019

Analytical Report:

Internal project code: 336/12/18

Analysis result global migration:

Parameter	Sample-BS Sim. A	Sample-BS Sim. B	Sample-BS Sim. C	Dimension
Simulant	10% ethanol	3% acetic acid	50% ethanol	---
Volume (simulant)	225	200	205	mL
Migrated area	1	1	1	dm^2
Globalmigrat	< 0.10	< 0.10	< 0.10	mg/dm^2

Result screening of low volatile substances related to migrated area:

Parameter	Sample-BS Sim. A 10% ethanol	Sample-BS Sim. B 3% acetic acid	Sample-BS Sim. C 50% ethanol	Dimension
∑ Hydrocarbons	0.057	0.091	0.084	mg/dm²
Fatty acids / esters / amides	< 0.01	0.02	0.310	mg/dm²
∑ Glycols	< 0.01	< 0.01	< 0.01	mg/dm²

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ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-14360-01-00

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Chemische Produkte-Beratung
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Telefon: 06841 - 189 97 -0
Telefax: 06841 - 189 97 -17

CBA GmbH, Konrad-Zuse-Straße 10, 66459 Kirkel-Limbach

NANO4LIFE EUROPE L.P.®
Vouliagmenis Ave. 318
Ag. Dimitrios - 173 43
Athens

Kirkel-Limbach, 15.02.2019

Analytical Report:

Internal project code: 336/12/18

Evaluation:

The samples are glass plates, Sample 1 is uncoated and Sample 2 is coated with "Nanodiamond Line".

The samples were migrated with 10 % Ethanol as well as 3 % Acetic Acid and 50% Ethanol for 10 days at 40°C. The global migrates for all samples and simulants are below 0.10 mg/dm^2 and thus below the requirements of max. 10 mg/dm^2 in accordance with the Commission Regulation (EU) No. 10/2011[a]. A residue in each vessel could not be visually detected. A change of the coated sample through migration was not visible since the coating could not be visually detected. The hydrocarbons, glycols and fatty acids/esters/amides detected were present in traces, with the exception of the migration with 50% Ethanol in which fatty acids/esters/amides were found. This is probably due to the handling of the coating since the coating itself does not contain any of the substances found.

Thus, the coating tested meets the requirements of §§30 and 31 LFGB[b] as well as those of the Regulation (EC) No 1935/2004[c] and the Commission Regulation (EU) No. 10/2011[a] on materials and articles intended to come into contact with food.

Composed by:

Steffen Wagner, Head of sector consumer goods

[a] Commission Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food (14.09.2018).
[b] German Food and Feed Code of 30 June 2017 (Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch)
[c] Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC (07.08.2009)

Die Akkreditierung gilt für die mit * gekennzeichneten Prüfverfahren. Prüfergebnisse beziehen sich ausschließlich auf die uns vorliegenden Prüfmuster. Prüfberichte dürfen ohne schriftliche Genehmigung der CBA GmbH nicht in Auszügen veröffentlicht werden.

Geschäftsführung: Ingrid Graf, Holger Graf
Registergericht: Homburg HRB 3760, Steuer-Nr.: 075/107/00389, Ust-ID-Nr.: DE 138344417
Bankverbindung: Kreissparkasse Saarpfalz, IBAN: DE 25 594 500 10 10 10 664 504, BIC: SALADE 51 HOM

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-14360-01-00

Material and Engineering Laboratory-Taipei

TESTREPORT

REPORT NO. : HV-18-06733
PAGE: 1 OF 3
REPORT DATE: Jan. 07, 2019

NAN04LIFE EUROPE L.P.
VOULIAGMENIS AVE. 318 AGIOS DIMITRIOS-ATHENS - GREECE

Product Name:	NANODIAMOND4-CARPAINT
Product Type:	ANTISCRTCH COATING
Product Color:	TRANSPARENT
Manufacturer:	NANO4LIFE EUROPE L.P.
Supplier:	NANO4LIFE EUROPE L.P.
Buyer/Order No. :	061118
Product Submitted By:	NANO4LIFE EUROPE L.P.
Date of Receive:	DECEMBER 24, 2018
Date of Testing:	DECEMBER 24, 2018 ~ JANUARY 07, 2019
Remark:	The infonnation mentioned in the above section is provided by Client (Exclude Date of Sample Received and Date of Testing)

The laboratory tests according to the test requests and samples provided by client, and the results are as tollows:

Test Required : Pencil Hardness

Test Method : Please see attached sheets

Test Result : Please see attached sl1eets

The value of required specifications are for reference only.
Conformity judgen1ent is the Applicant's tínal verdict.

Signed for and on behalf of
SGS Taiwan Ltd.

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SGS Taiwan Ltd. No.35, Wu Chyuan Road, New Taipei Industrial Park, Wu Ku District, New Taipei City, Taiwan
t (886-2)2298-3355 f (886-2) 2299-7857 www.tw.sgs.com
Member of SGS Group

TESTREPORT

Pencil Hardness

Test Equipment :

Name	Brand	Model
Pencil	MITSU-BISHI	uni

Test Method :

JIS K5400(I 990) Testing Methods for Paints

Test Condition :

The variety of pencil hardness :

6B - 5B - 4B - 3B - 2B - B - HB - F - H - 2H - 3H - 4H - 5H - 6H - 7H - 8H - 9H

Soft <——————————————> Hard

Load : 1000g

Evaluation Method : Scratch Hardness

Test Result :

Test Item(s)	Test Result(s)
Pencil Hardness	9H

The value of required specifications are for reference only. Conformity judgement is the Applicant's final verdict.

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t (886-2) 2298-3355 f (886-2) 2299-7857
www.tw.sgs.com
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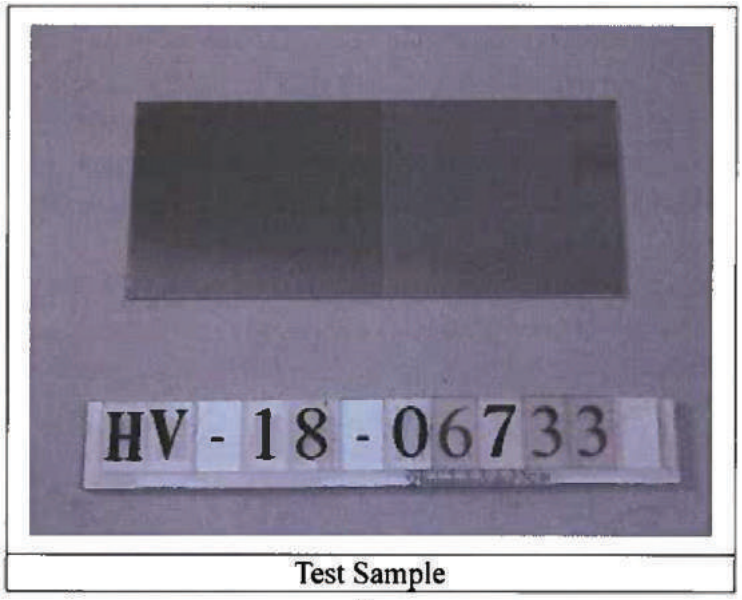
Material and Engineering Laboratory-Taipei

TESTREPORT

Sample Photo :



Test Sample

----- o O o -----

The value of required specifications are for relerence only.
Co11forınity judgen1ent is the Applicant's final verdíct.

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HOHENSTEIN Textile Testing Institute GmbH & Co. KG
Schlosssteige 1, 74357 Bönnigheim, Germany

OEKO-TEX®
CONFIDENCE IN TEXTILES

CERTIFICATE

The Company

NANO4LIFE EUROPE L.P.
Vouliagmenis 318
17343 Athen, GREECE

is granted authorisation according to ECO PASSPORT by OEKO-TEX® to use the OEKO-TEX® mark

OEKO-TEX®
CONFIDENCE IN TEXTILES
ECO PASSPORT
12.0.16133 HOHENSTEIN HTTI
Textile chemicals. Tested and verified.
www.oeko-tex.com/ecopass

for the following chemical products

Product(s): See attached enclosure
Category: Finishing agents

Supporting documents

- Declaration of conformity in accordance with EN ISO 17050-1 included in ECO PASSPORT by OEKO-TEX® Terms of Use.
- Base certificate(s) of chemical manufacturer(s).
- Analytical test report number: 19.0.72088

The above captioned product(s) can be used for the production of human-ecological optimized textiles. The combined results of the reports mentioned above reveal that there is no harmful effect on the human and environmental health of the textiles treated/finished with the above mentioned products. This evaluation used the test methods and requirements of the ECO PASSPORT by OEKO-TEX® that were in force at the time of the evaluation date.
ZDHC MRSL Conformance Level 1 is achieved for certified product(s) without restriction(s).

The certificate 12.0.16133 is valid until 31.05.2020

Boennigheim, 23.04.2019

Dipl.-Ing. (FH) Elisabeth Panian
Head of Certification Body OEKO-TEX®
HOHENSTEIN HTTI

OEKO-TEX®
INSPIRING CONFIDENCE

Enclosure to Certificate No. 12.0.16133

ECO PASSPORT by OEKO-TEX®

OEKO-TEX® - International Association for Research and Testing in the Field of Textile and Leather Ecology.

OEKO-TEX®
CONFIDENCE IN TEXTILES
ECO PASSPORT

OEKO-TEX® Service GmbH | Genferstrasse 23 | P.O. Box 2006 | CH-8027 Zurich
Phone +41 44 501 26 00 | info@oeko-tex.com | www.oeko-tex.com

HOHENSTEIN Textile Testing Institute GmbH & Co. KG
Schlosssteige 1, 74357 Bönnigheim, Germany

OEKO-TEX®
INSPIRING CONFIDENCE

Company

NANO4LIFE EUROPE L.P.
Vouliagmenis 318
17343 Athen, GREECE

ECO PASSPORT by OEKO-TEX® Lab Report No.

19.0.72088

ECO PASSPORT by OEKO-TEX® Certified Products

No.	Product name	Trade name	Restriction(s) [1]	ZDHC LEVEL
1	Nano4-Carseat®	Nano4-Carseat®	none	Level 1
2	Nano4-Furniture®	Nano4-Furniture®	none	Level 1
3	Nano4-Leather®	Nano4-Leather®	none	Level 1
4	Nano4-MC Jacket®	Nano4-MC Jacket®	none	Level 1
5	Nano4-Marinetextile®	Nano4-Marinetextile®	none	Level 1
6	Nano4-Shoes®	Nano4-Shoes®	none	Level 1
7	Nano4-Textile®	Nano4-Textile®	none	Level 1
8	Nano4-Ultracoat®	Nano4-Ultracoat®	none	Level 1

Issue Date 23.04.2019

[1] Restriction(s): The parameter(s) mentioned under Restriction(s) have to be checked on the treated textile for compliance with the regulations of STANDARD 100 by OEKO-TEX®.

Intertek Wilton

Test Report

FDA overall migration analysis of Nano4life SiO_2 easy to clean product line.

Test Report : **IWTN/W000001267ARLM001**

Prepared for : **Ioannis Drivas**

NANO4LIFE EUROPE

NANO4LIFE EUROPE
VOULIAGMENIS 318
AG. DIMITRIOS
173 43
ATHENS
GREECE

Prepared by:

Edward Pallister
Junior Analyst
Intertek Wilton

Intertek Wilton
N121
ITS Testing Services (UK) Ltd
The Wilton Centre
Redcar
TS10 4RF

Telephone: 01642435795
Fax: 01642 435777

Email: edward.pallister@intertek.com

UKAS TESTING
0967

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TEST REPORT

Report Number:	IWTN/W000001267ARLM001
Chit Number:	ITWI-00000010499A
Receipt Date:	15/07/2014
Lab Book Reference:	
File Reference Location:	N110/N112
Number of Samples:	2
Method Reference:	21CFR 175:300 table 1 & 2

Samples Submitted

Intertek Sample Reference	Sample Description	Customer Identifier
IWTN/W000001267A-1	Substrate coated in Silicone Dioxide solution	Coated
IWTN/W000001267A-2	Uncoated substrate	Uncoated

Description of Work Required

Ref: 21CFR 175:300 table 1 & 2 FDA Overall Migration

Experimental

50 square inches of sample were exposed by total immersion to 100mL of distilled water, 10% v/v aqueous ethanol, and heptane. Samples undergoing extraction in distilled water, and 10% v/v aqueous ethanol were exposed for 24 hours at 66°C. Samples undergoing heptane extraction underwent exposure at 38°C for 30 minutes. At the end of the exposure period the samples were removed from the extractants. The extractants were filtered and evaporated to dryness. Total extractives were determined gravimetrically.

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Results, Interpretation and Opinions

Sample	Extractant	Exposure Time / Hours	Temp / °C	Total extractives / mg/inch²	Mean total extractives / mg/inch²
Coated	Distilled water	24	66	0.58	0.60
Coated				0.60	
Coated				0.62	
Uncoated	Distilled water	24	66	0.58	0.55
Uncoated				0.55	
Uncoated				0.54	
Coated	10% v/v Ethanol	24	66	0.60	0.61
Coated				0.63	
Coated				0.61	
Uncoated	10% v/v Ethanol	24	66	0.58	0.61
Uncoated				0.60	
Uncoated				0.64	
Coated	Heptane	0.5	38	0.89	0.85
Coated				0.86	
Coated				0.80	
Uncoated	Heptane	0.5	38	0.99	0.90
Uncoated				0.79	
Uncoated				0.94	

Conclusions

Limit of extractives is 18 mg/inch^2 for coatings intended for repeat use, and employed other than as a component of a container, as stated in FDA 21 CFR 175:300 paragraph (c),(4). Therefore the mean results for both coated and uncoated samples meet the extractive limit for all extractants and the samples pass the regulations for their intended use in food contact.

Report Authorisation

Edward Pallister
Junior Analyst

E. Pallister

Date: 28/08/2014

David Eaves
Regulatory
Consultant

Date: 28/08/2014

Intertek Wilton welcomes feedback on all aspects of the service provided to you. Please email any comments that you have to wilton.feedback@intertek.com

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ASSOCIAÇÃO PORTUGUESA DAS EMPRESAS DE BETÃO PRONTO

Sede e Unidade Laboratorial de Lisboa:
Av.ª Conselheiro Barjona de Freitas, 10 A - 1500-204 LISBOA
Tel.: 21 778 53 65, 21 774 19 25, 21 774 19 32 - Fax.: 21 778 58 39
Unidade Laboratorial do Porto:
Zona Industrial da Carriça, Lote 17 - 4745-312 MURO
Tel.: 22 986 74 00, 22 986 74 01, 22 986 74 02 - Fax.: 22 986 74 08

IPAC acreditação
L0040
Ensaios

RELATÓRIO DE ENSAIO

Processo: P14/01271 **Ensaio:** 3505 **Relatório:** P14/003089 **Data:** 18-03-2015

CONCRETE
Depth of penetration of water under pressure

Marca: --
Designação: C30/37 S3 XC4 (P) D22 Cl 0,1 HID

Requerente: OAU2WORK+, Lda

Obra: --

Identificação: Dois cubos 15x15

Pedido: Guia de Remessa de 03/11/2014
Data de Entrada: 03-11-2014

NANO4LIFE-IBERICA
Pedro Rodrigues
Rua Silvio Brinco
Edifício Nova Centralidade, S/N
4465-226 Matosinhos

DIRECTOR DE SERVIÇOS LABORATORIAIS — *João André*

TÉCNICO DE BETÃO — *Paulo José*

Test Specimen		Date of the test		Maximum depth of penetration (mm)
Identification	Description	Start	End	
1-N4STONE	Specimen cubic. Nominal sizes: 150 mm	03-11-2014	06-11-2014	33
2-PADRÃO	Specimen cubic. Nominal sizes: 150 mm	03-11-2014	06-11-2014	85

Direction of application of water pressure with respect to the casting direction: perpendicular.

Test carried out according to standard EN 12390-8: 2009.

Specimen delivered by the customer.

The test results relate only to the items tested.
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CERTIFICATE EXPLANATION: A.P.E.B. - **A**ssociação **P**ortuguesa das **E**mpresas de **B**etão Pronto (TRANS.: Portuguese Association for Concrete Producers) is one of most reputated institution in Portugal that certifies concrete production and all materials necessary to do it. They are members of E.R.M.C.O.-European Ready Mixed Concrete Organization and other European organizations.
The lab test that we order consists in creating two standard concrete cubic samples with the dimension of 150mmx-150mmx150mm
One of them identified by "Provete **1-NANO4-STONE"** on the certificate report, was coated in one surface with 15g of **NANO4-STONE** and the second identified by **"Provete 2-PADRAO"** without coated .
After this, both cubic samples where submitted to a continuous hydrostatic pressure of 5 bar during 72 hours.
The result was awesome. **NANO-4STONE** improved by 2.5 times more the resistance to water pressure in this particular concrete composition " C30/37 " (Class of concrete resistance at 28 days in MPA) " S3" (Class of workability/fluidity with a "SLUMP" cone test) " XC4"(Environmental class- that obligates a minimum amount of cement or thin materials) This particular reference of concrete " C30/37S3XC4 ".

Polymer Service GmbH Merseburg
An-Institut an der Martin-Luther-Universität Halle-Wittenberg

Report

about the

Artificial weathering with fluorescent UV lamps according to ISO 11507, method A for different coatings on sandstone

Order Number: 72013209

Customer:

NANO4LIFE EUROPE®
Vouliagmenis Ave. 318
Ag. Dimitrios - 173 43
ATHENS
GREECE

Contractor:

Polymer Service GmbH Merseburg
Business Area
Plastics Testing and Plastic Diagnostics
Prof. Dr. rer. nat. habil. W. Grellmann
Geusaer Str., Building Fo 131
D-06217 Merseburg

Tel.: 03461 462777
Fax: 03461 462592
E-Mail: wolfgang.grellmann@iw.uni-halle.de
Internet: www.polymerservice-merseburg.de

Processor:

Dr.-Ing. Marcus Schoßig
Tel.: 03461 46 2874
E-Mail: marcus.schossig@psm.uni-halle.de

This report contains -6- pages inclusive first page as well as -1- appendix.

Content

1. Problem, Materials and Exposition

For the examinations, the customer provided sandstone materials with two different coatings; NANO4-STONE and AG INDUSTRIES. The objective is the assessment of the aging behavior according to ISO 11507, method A. Figure 1 shows a photograph of the sandstone materials in the used specimen holders before the weathering started.

Figure 1: Photograph of the sandstone materials mounted on the used specimen holders

2. Experimental Details

2.1 Artificial Weathering according to ISO 11507, Method A – Fluorescent UV lamps and Water [1]

INTRODUCTION

For many products, it is necessary to be weather-resistant mainly to UV radiation. However, under "weather-resistant" should be understood the fulfillment of the requirement profile of the products. For example, an aging effect can be existent, if products show optical changings like discolorations or loss of gloss. These effects are a clear fault for the customers. The term **aging** is defined in the standard DIN 50035 as 'the accumulation of irreversible chemical and physical reactions in a materials' [*„die Gesamtheit aller im Laufe der Zeit in einem Material irreversibel ablaufenden chemischen und physikalischen Vorgänge"]* [2].

During the use of technical products, a natural weathering as well as a weathering behind window glass over several years can be occur. Based on the dependency of the results on the weathering location, this means from the local climate, the season as well as the position on the earth, the artificial weathering has significant benefits for the assessment of the weatherability. Predictions, which are independent of the location, are possible by a constant and reproducible irradiance, temperature, and moisture as well as condensation or spray cycles.

The most important thing for the choice of a suitable test method is an adequate simulation of the solar radiation by the used radiation source. This is realized by **xenon-arc lamps** through the usage of proper filters, wherefore the xenon-arc lamps are preferred for the simulation of the

global irradiance. The photochemical effective UV and short-wavelengths range is important for the aging of polymers. For such investigations, **fluorescent UV lamps** are used.

For the simulation of the UV radiation in the QUV/SPRAY (Co. Q-LAB CORPORATION, USA), fluorescent UV lamps according to ISO 11507 were used. The radiation emission in the UV range, this means below 400 nm, is minimum 80 % of the total emission. Typically, fluorescent UV lamps are used with a radiation content of less than 2 % below 300 nm and an emission peak at 340 nm (UV-A-340, Type II) [1]. The required spectral distribution is realized through a proper selection of the phosphor coating on the inner surface of the lamps and the used glass type. Figure 2 shows the irradiance of direct sunlight in comparison to the UV radiation of the used UV-A-340 lamp. The solar energy barrier (UV cut-off) is 295 nm and the radiation maximum is 340 nm.

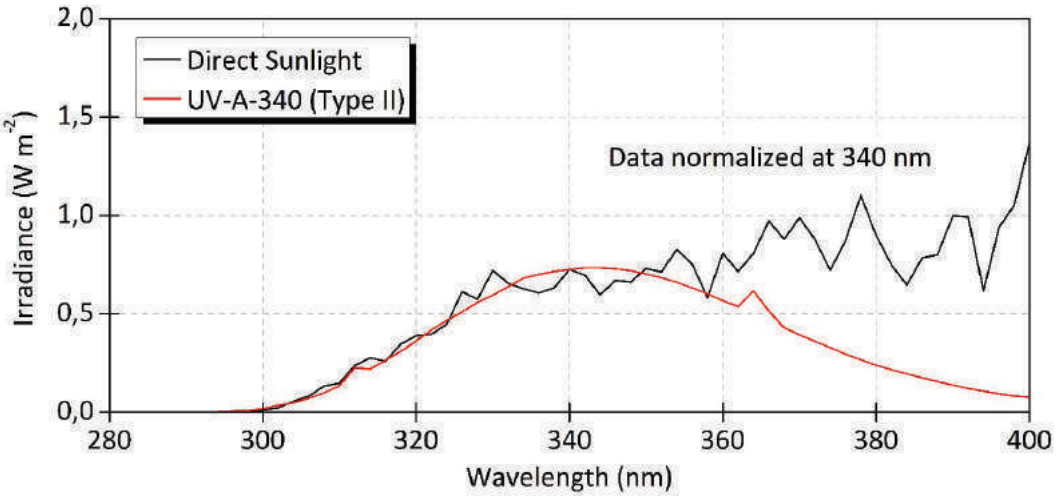

Figure 2: Comparison of the spectrum of the fluorescent UV lamp UV-A-340 (Type II) with direct sunlight [3]

EXPERIMENTAL DETAILS

By the method A – according to ISO 11507 – the specimens were exposed to UV radiation, temperature and condensation phase with distilled water to reproduce weathering effects, which can appear in reality and for the use of the products typical environments (UV radiation) in the material. The test condition are listed below and Figure 3 shows the used accelerated weathering tester QUV/SPRAY.

Table 1: Test conditions according to ISO 11507, method A

Lamp type	UV-A-340 (Type II)
Irradiance E_λ	0.76 W · m^{-2} · nm^{-1}
Black panel temperature	60°C ± 3°C
Black panel temperature during condensation	50°C ± 3°C
Method A:	
Dry phase	4 hours
Condensation	4 hours (UV lamps off)
Exposure time	3500 h

Figure 3: Accelerated weathering tester QUV/SPRAY and water treatment plant type ELIX 15

2.2 Determination the Contact Angle according to DIN 55620-1 and DIN 55620-2 [4, 5]

The determination of the contact angle θ according to DIN 55660-2 took place with distillated water as test liquid. The measurements were realized with the testing device DSA100 TROPFENANALYSE-SYSTEM (DROP ANALYSIS SYSTEM) of the company KRÜSS GmbH, Germany. For the determination of the contact angle θ, the angle to the baseline, which arise to the tangent on the drop contour at the three-phase point, was used. This can be seen schematically in Figure 4.

The determination of the contact angle θ was repeated every 500 h in the center of the specimens. The test conditions are shown in Table 2.

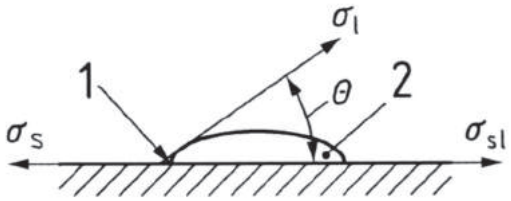

Figure 4: Schematic representation of the contact angle measurements; 1 – three-phase point, 2 – liquid, σ_l – surface energy of the liquid, σ_S – free surface of the solid state surface, σ_{Sl} – interface energy between solid state surface and liquid. θ – contact angle [4]

Table 2: Test conditions for the measurements of the contact angle

Test liquid:	distillated water
Drop capacity:	4 µl
Number of drops:	10
Manner of contact angle measurements:	static
Numerical method (measurement range):	
Young-Laplace equation	20° till 110° and 110° till 180°

3. Results

The contact angle θ was measured every 500 h within a period of 3500 h. A graphical representation of the result is shown in the following figure and a tabular listing can be found in appendix 1.

Figure 5 shows the dependence of the values determined for the contact angle θ on the exposure time for the coatings NANO4-STONE and AG INDUSTRIES on sandstone. Both coatings show a contrary behavior. For the coating AG INDUSTRIES, an initial value of 130.8° and after an exposure time of 500 h of 50.6° was determinable. A determination of the contact angle after further 500 h was not possible, because the contour of the drop was not stable enough for a reliable measurement. The coating NANO4-STONE shows a different behavior shows, which is characterized by an increase in the contact angle θ from 131.6° to 147.9° after an exposure time of 3500 h. A possible interpretation of this behavior is the chemical post-crosslinking of the coating.

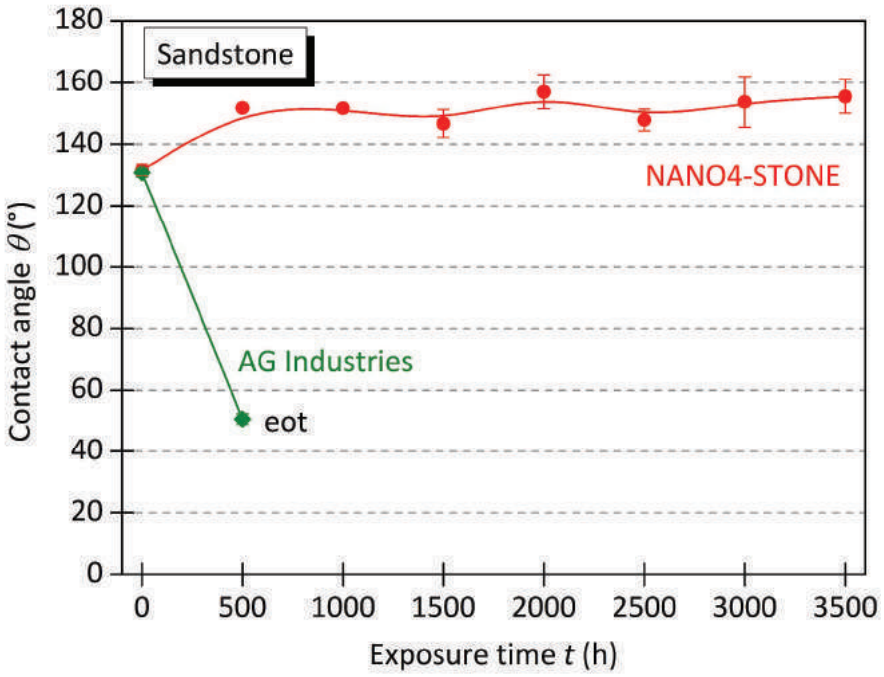

Figure 5: Comparison of the coating NANO4-STONE and AG INDUSTRIES on the weathering stability; eot … **e**nd **o**f **t**est

4. Literature

[1] ISO 11507 (2007-05): Paints and varnishes – Exposure of coatings to artificial weathering – Exposure to fluorescent UV lamps and water

[2] DIN 50035 (2012-09): Terms and definitions used on ageing of materials – Polymeric materials

[3] Fowler, S.: Spectral power distribution data for UVA-340 and UVA-351 lamps used in the QUV, and Daylight-Q and Window-Q filters used in the Q-Sun. Q-Lab Corporation, Personal Communication September 6, 2011.

[4] DIN 55660-1 (2011-12): Paints and varnishes – Wettability – Part 1: Terminology and general principles

[5] DIN 55660-2 (2011-12): Paints and varnishes – Wettability – Part 2: Determination of the free surface energy of solid surfaces by measuring the contact angle

Mean value of the contact angle θ (°); Weathering with UV fluorescent lamps according to ISO 11507, method A

Material	Coating	Initial value	SD	500 h	SD	1000 h	SD	1500 h	SD	2000	SD	2500	SA	2000	SD	2500	SA
Sandstone	NANO4-STONE	**131,6**	1,9	**151,8**	0,7	**151,7**	0,8	**146,7**	4,5	**157,0**	5,5	**147,9**	3,5	**153,7**	8,2	**155,5**	5,5
	AG INDUSTRIES	**130,8**	1,4	**50,6**	1,7	**sink in**		**sink in, 2 s (eot)**									

Polymer Service GmbH Merseburg
An-Institut an der Martin-Luther-Universität Halle-Wittenberg

Report

about the

Artificial weathering with fluorescent UV lamps according to ISO 11507, method A for a coating on textile

Order Number: 72013209

Customer:
NANO4LIFE EUROPE®
Vouliagmenis Ave. 318
Ag. Dimitrios - 173 43
ATHENS
GREECE

Contractor:
Polymer Service GmbH Merseburg
Business Area
Plastics Testing and Plastic Diagnostics
Prof. Dr. rer. nat. habil. W. Grellmann
Geusaer Str., Building Fo 131
D-06217 Merseburg

Tel.: 03461 462777
Fax: 03461 462592
E-Mail: wolfgang.grellmann@iw.uni-halle.de
Internet: www.polymerservice-merseburg.de

Processor:
Dr.-Ing. Marcus Schoßig
Tel.: 03461 46 2874
E-Mail: marcus.schossig@psm.uni-halle.de

This report contains -6- pages inclusive first page as well as -1- appendix.

Content

1. Problem, Material s and Exposition

For the examinations, the customer provided a textile specimen with the coating NANO4-PREMIUMTEXTILE. The objective is the assessment of the aging behavior according to ISO 11507, method A. Figure 1 shows a photograph of the textile specimen in the used specimen holders before the weathering started.

Figure 1: Photograph of the textile specimen mounted on the used specimen holders

2. Experimental Details

2.1 Artificial Weathering according to ISO 11507, Method A – Fluorescent UV lamps and Water [1]

INTRODUCTION

For many products, it is necessary to be weather-resistant mainly to UV radiation. However, under "weather-resistant" should be understood the fulfillment of the requirement profile of the products. For example, an aging effect can be existent, if products show optical changings like discolorations or loss of gloss. These effects are a clear fault for the customers. The term agingis defined in the standard DIN 50035 as 'the accumulation of irreversible chemical and physical reactions in a materials' [„die Gesamtheit aller im Laufe der Zeit in einem Material irreversibel ablaufenden chemischen und physikalischen Vorgänge"[2]].

During the use of technical products, a natural weathering as well as a weathering behind window glass over several years can be occur. Based on the dependency of the results on the weathering location, this means from the local climate, the season as well as the position on the earth, the artificial weathering has significant benefits for the assessment of the weatherability. Predictions, which are independent of the location, are possible by a constant and reproducible irradiance, temperature, and moisture as well as condensation or spray cycles.

The most important thing for the choice of a suitable test method is an adequate simulation of the solar radiation by the used radiation source. This is realized by xenon-arc lamps through the usage of proper filters, wherefore the xenon-arc lamps are preferred for the simulation of the

global irradiance. The photochemical effective UV and short-wavelengths range is important for the aging of polymers. For such investigations, fluorescent UV lamps are used.

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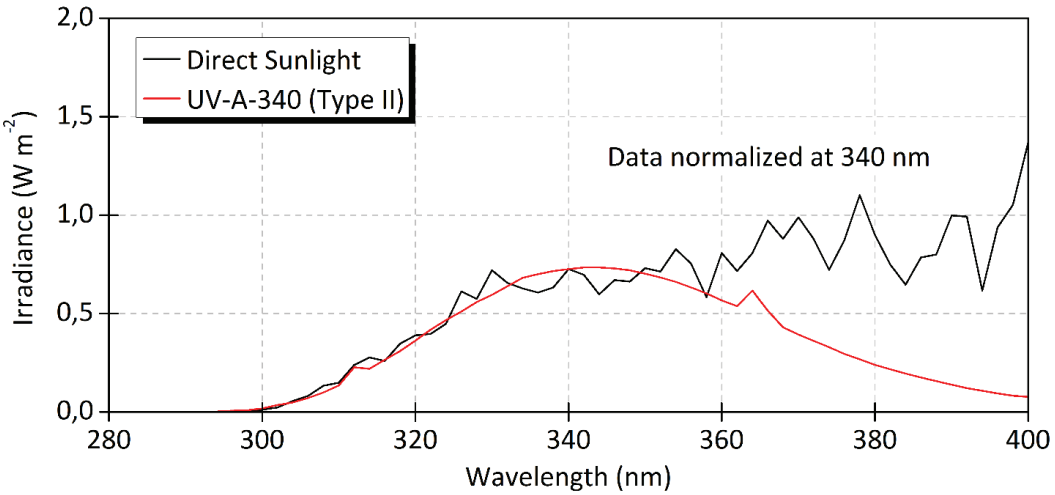

Figure 2: Comparison of the spectrum of the fluorescent UV lamp UV-A-340 (Type II) with direct sunlight [3]

EXPERIMENTAL DETAILS

By the method A – according to ISO 11507 – the specimens were exposed to UV radiation, temperature and condensation phase with distilled water to reproduce weathering effects, which can appear in reality and for the use of the products typical environments (UV radiation) in the material. The test condition are listed below and Figure 3 shows the used accelerated weathering tester QUV/SPRAY.

Table 1: Test conditions according to ISO 11507, method A

Lamp type	UV-A-340 (Type II)
Irradiance E_λ	0.76 W · m^{-2} · nm^{-1}
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The determination of the contact angle θ was repeated every 500 h in the center of the specimens. The test conditions are shown in Table 2.

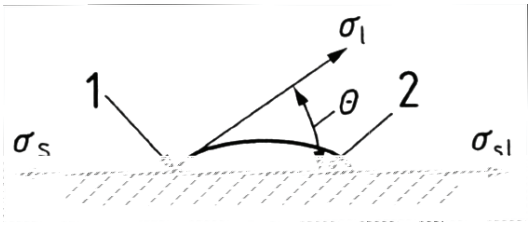

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Table 2: Test conditions for the measurements of the contact angle

Test liquid:	distillated water
Drop capacity:	4 µl
Number of drops:	10
Manner of contact angle measurements:	static
Numerical method (measurement range):	
Young-Laplace equation	20° till 110° and 110° till 180°

3. Results

The contact angle ⍁was measured every 500 h within a period of 3500 h. A graphical representation of the result is shown in Figure 5 and a tabular listing can be found in appendix 1. The coating NANO4-PREMIUMTEXTILE shows an increase in the contact angle ⍁ from 131.0° to 142.8° after 3500 h weathering, which can be explained with a chemical post-crosslinking.

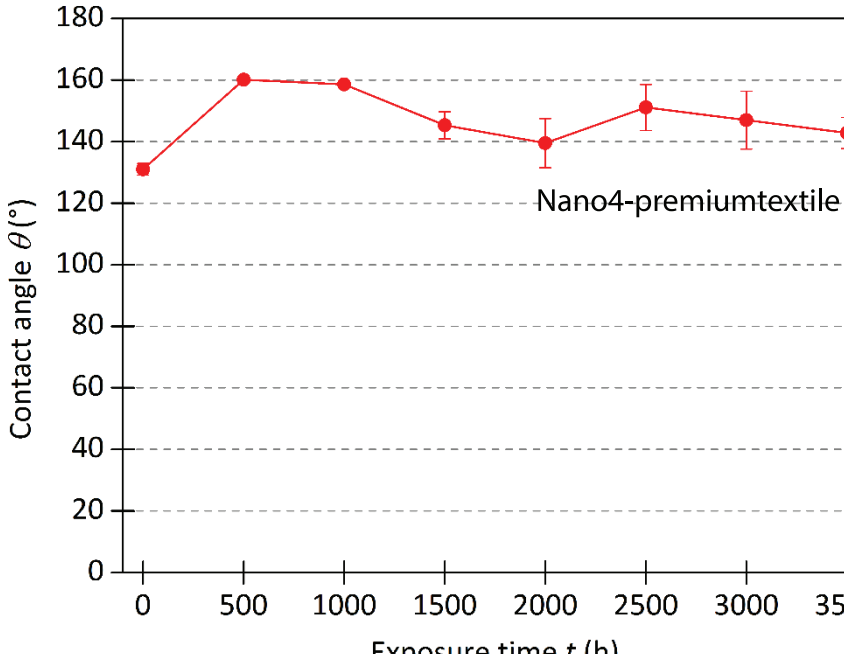

Figure 5: Representation of the contact angle ⍁ in dependence on exposure time t for NANO4-PREMIUMTEXTILE

4. Literature

[1] ISO 11507 (2007-05): Paints and varnishes – Exposure of coatings to artificial weathering – Exposure to fluorescent UV lamps and water

[2] DIN 50035 (2012-09): Terms and definitions used on ageing of materials – Polymeric materials

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[5] DIN 55660-2 (2011-12): Paints and varnishes – Wettability – Part 2: Determination of the free surface energy of solid surfaces by measuring the contact angle

Mean value of the contact angle θ (°); Weathering with UV fluorescent lamps according to ISO 11507, method A

Material	Coating	Initial value	SD	500 h	SD	1000 h	SD	1500 h	SD	2000	SD	2500	SA	3000	SD	3500	SA
Textile	NANO4-PREMIUMTEXTILE	131,0	1,9	160,1	0,7	158,6	0,7	145,3	4,4	139,5	8,0	151,1	7,5	147,0	9,4	142,8	5,1

Simplified Report No.: 13_03311-a	Receipt date: October 3th of 2013 Test end date: November 12th 2013 Report emission date: November 25 of 2013
	Page 1 of 2

Client:	NANO4LIFE EUROPE
Contact person:	Andreas Dimitras
Address:	Vouliagmenis Ave 318 - Dimitrios
Town:	17343 ATHENS (Greece)

Reference	Standard	Title	Specimen	Pressure (cm/H_2O)
Nano4-premiumtextile	UNE-EN 20811:1993	Determination of resistance to water penetration. Test under hydrostatic pressure	1	29.4
			2	21.3
			3	20.9
			4	19.1
			5	18.5
			Average	21.8
			Standard deviation	4.4

Reference	Standard	Title	Specimen	Degree of wetting
Nano4-premiumtextile	UNE-EN ISO 4920:2013	Determination of the fabric resistance to wetting (spray test)	1	ISO 3 (See table below)
			2	
			3	

Interpretation of wetting degree / Photographic scale	
ISO 5	There is no adherence not wetted of the surface
ISO 4	Light adherence or light wetted dispersed of the top surface
ISO 3	Wetted of the top surface in the points of sprayed
ISO 2	Wetted partial of the whole top surface
ISO 1	Wet complete of the whole top surface

Reference	Standard	Title	Specimen	Average permeability ($g/m^2 \cdot 24$ h)	Index (%)
Nano4-premiumtextile	BS 7209:1990 Appendix B	Water vapour permeability (transpirability)	Standard fabric	821.965	89.002
			Tested sample	731.566	

Simplified Report No.: 13_03311-a	Receipt date: October 3th of 2013 Test end date: November 12th 2013 Report emission date: November 25 of 2013
	Page 2 of 2

Client:	NANO4LIFE EUROPE
Contact person:	Andreas Dimitras
Address:	Vouliagmenis Ave 318 - Dimitrios
Town:	17343 ATHENS (Greece)

Reference	Standard	Title	Result
Nano4-premiumtextile	UNE-EN ISO 105-B02:2013	Colour fastness to artificial light: Xenon arc fading lamp test (24 hours)	5

Reference	Standard	Title	Specimen	Water vapour resistance (m^2Pa/W)
Nano4-premiumtextile	UNE-EN 31092:1996	Water vapour resistance	1	2.95
			2	2.99
			3	3.00
			Average	2.98
			Standard deviation	0.03

Reference	Standard	Title	Specimen	Thermal resistance Rct (m^2K/W)
Nano4-premiumtextile	UNE-EN 31092:1996	Thermal resistance	1	0.0132
			2	0.0133
			3	0.0130
			Average	0.0132
			Standard deviation	0.0002

tecnalia Inspiring Business

Blanca Ruiz de Gauna
Construction Materials Characterization
Laboratory Manager
Technological Services Division

* The results of this report concern only and exclusively to the material tested.
* The complete information related to the required tests is at client's disposal on request.
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Simplified Report No.: 13_03312-a	Receipt date: October 3th of 2013 Test end date: November 6th 2013 Report emission date: November 22 of 2013
	Page 1 of 1

Client:	NANO4LIFE EUROPE
Contact person:	Andreas Dimitras
Address:	Vouliagmenis Ave 318 - Dimitrios
Town:	17343 ATHENS (Greece)

Reference	Standard	Title	Product	Classification
Nano4-stone	UNE-EN ISO 10545-14:1998	Determination of resistance to stains	Green staining agent on light oil	Class 5 (Tiles that is easier to disappear a specific staining agent)
			Alcoholic solution of iodine (13 g/l)	
			Olive oil	

Reference	Standard	Title	Classification	Abrasion stage of visible defect
Nano4-stone	UNE-EN ISO 10545-7:1999	Determination of resistance to surface abrasion	Class 3	1.500 revolutions

Reference	Standard	Title	Permeability coefficient (IC)
Nano4-stone	UNE-EN 539-1:2007	Impermeability test	0

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Blanca Ruiz de Gauna
Construction Materials Characterization
Laboratory Manager
Technological Services Division

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Central Building Plan Department
40 Scotts Road #12-00
Environment Building
Singapore 228231
Tel: 1800-2255-632
Fax: 67319725
http://www.nea.gov.sg

PLEASE QUOTE OUR REF IN YOUR REPLY

Our Ref: IA2013- 01741

DID: 67319648
FAX: 67319725

Date: 6 Jun 2013

M/s Nano Times Technologies
Email: nanotimestech@gmail.com

Attn: Ms Tan Li Shan

Dear Mdm

PROPOSED USE OF INDUSTRIAL PREMISES AT BLK 1045 EUNOS AVENUE 4 #01-142 SINGAPORE 409795 BY M/S NANO TIMES TECHNOLOGIES FOR END PROCESS MANUFACTURING OF NANO-COATINGS BY MEANS OF DILUTING/MIXING CONCENTRATED NANO COATING FORMULATION WITH DEMINERALISED WATER, ETHANOL AND SULFURIC ACID

We refer to your IA application for dilution and repackaging of nano coating solutions for retail distribution.

2 We noted your declaration that the proposed use of the subject site will not emit air pollutants or generate waste water. We have in-principle no objection to the proposal subject to compliance with the following requirements:

Hazardous Substances / Chemical Control

a) A Hazardous Substances Licence/Permit, shall be obtained from Chemical Control Section of Pollution Control Department for purchase, use and storage of chemicals/hazardous substances at the premises. The chemicals to be stored and use shall be in accordance to what you have provided in your online application form.

b) The types and quantities of chemicals stored/used shall be restricted to those stated in the IA application form submitted.

c) Containment facility shall be provided to ensure that spillage/leak are contained and not cause environmental pollution problem.

Toxic Industrial Waste Control

d) Toxic industrial waste, expired or spilled chemicals shall be kept in suitable containers fitted with caps and stored within covered areas and equipped with spillage or leakage containment facilities before disposal by licensed toxic industrial waste collectors.

Noise Pollution Control

e) Noise abatement measure, if required, shall be provided to ensure that the noise level at the factory boundary generated from the production activities, does not

Central Building Plan Department
40 Scotts Road #12-00
Environment Building
Singapore 228231
Tel: 1800-2255-632
Fax: 67319725
http://www.nea.gov.sg

exceed the noise limits stipulated in the **Environmental Protection and Management** (Boundary Noise Limits for Factory Premises) Regulations.

3 Technical details of the pollution control equipment shall be submitted to *Central Building Plan Department* for approval prior to installation. Pollution control equipment / facilities should be installed prior to commencement of operation.

4 The proposed activity shall comply with all the applicable requirements and provisions of the *Code of Practice on Pollution Control* (which can be downloaded at our website http://www.nea.gov.sg/info/cbpu) and the **Environmental Protection and Management Act.**

5 Please also note that there are severe penalties for causing pollution to the environment as stipulated under the Environmental Protection and Management Act. You are advised to exercise strict control and take necessary measure to ensure that your activities would not cause pollution to the environment.

6 You are advised to consult SCDF on their fire safety requirements, if any, on the use, handling and storage of flammable substances that you will have to comply with.

Yours faithfully

MARTINN HO
for CHIEF ENGINEER
CENTRAL BUILDING PLAN DEPARTMENT
This is a computer generated document. No signature is necessary

CE (Chemical Control Section), PCD
Pollution Control Department
Attn: Ms Fareena Bte Abdul Rahim

CE (Chemical Control Section)
Pollution Control Department
Attn: Mr Pierre Ng

CE (Inspectorate), PCD
Attn: Mdm Chua Gek Yong

TDResearch

Repellency and Color Stability Study

Prepared for
Zucora
552 Clarke Road
London, ON
N5V 3K5

Prepared by
Kyle Lawrence
TD Research Ltd.,
190 King Street
Ilderton, Ontario, Canada
N0M 2A0
June 11, 2012

TDResearch !

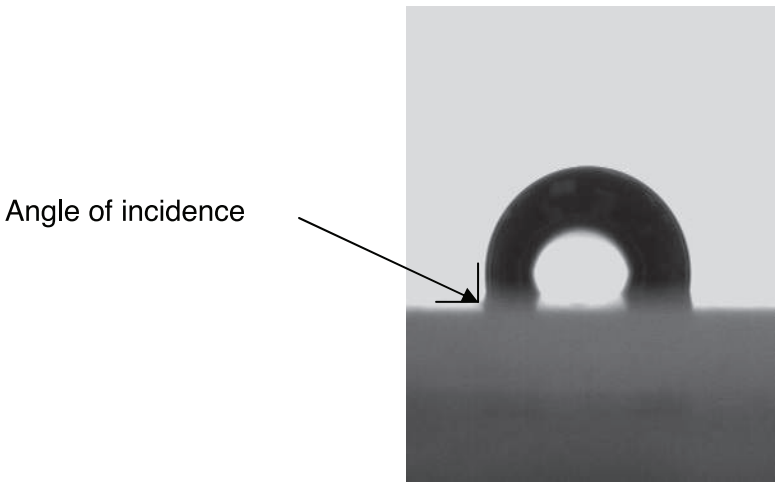
Scope: The purpose of this study is to compare the ability of fabric treatments to maintain repellency and color stability after extended UV exposure.

Products Tested:

Products	UPC#	Lot#
Bleached Cotton 400	-	1745
Poly-cotton	-	-
Nylon LC#11-T0017	-	-
Leather LC#10-T0214	-	-
Texturized Dacron 56T Double Knit Jersey (polyester)	-	4970
Eliane White Ceramic 4inx4in	-	-
Nano 4 Life Bathcare LC#12-T0446	-	206774445022
Nano 4 Life Premium Textile Concentrate LC#12-T0447	-	206774335101

Equipment Used: Drop Shape Analysis System (model# Kruss DSA 10 Mk2)
Biuged Instruments UV Weatherometer (LUV-III)
Konica Minolta Chromameter (CR-410)

Procedure: Each test product is sprayed onto various fabric swatches and allowed to dry for approximately 24hours before initial contact angle measurements are taken using the Drop Shape Analysis System, (model# DSA 10 Mk2), which measures the angle of incidence of an ultra low volume water drop on a horizontal surface, (see photo below). Initial L, a, b, color readings are also taken for each fabric after treatment using the Minolta Chromameter. Each test fabric is then exposed to UV light for four weeks before the color readings are re-read. Final contact angle measurements are also taken. The difference in color from the initial color readings and the color after UV exposure is expressed as delta E, (! E).



190 King St., Ilderton, ON N0M 2A0
Tel: (519) 666-3779 Fax: (519) 666-0575
www.tandellresearch.com

Results:

Table I: Contact Angle Study for Textiles

Products	Dilution	Fabric	Initial Contact Angle	Final Contact Angle (4 week exposure)
Nano 4 Life Premium Textile Concentrate LC#12-T0447	9:1	Leather	117.4°	116.9°
		Nylon	136.2°	130.7°
		Polyester	125.4°	131.3°
	19:1	Cotton	115.1°	134.5°
		Poly-Cotton	126.1°	130.1°

Table I: Contact Angle Study for Bathcare

Products	Dilution	Substrate	Initial Contact Angle	Final Contact Angle (4 week exposure)
Nano 4 Life Bathcare LC#12-T0446	RTU	Ceramic	85.9°	102.8°

Table III: ! E Color Change Study for Textiles

Products	Dilution	Fabric	4 week Color Change (! E)
Nano 4 Life Premium Textile Concentrate LC#12-T0447	9:1	Leather	0.87
		Nylon	2.86
		Polyester	2.22
	19:1	Cotton	0.75
		Poly-Cotton	3.41

Table IV: ! E Color Change Study for Bathcare

Products	Dilution	Substrate	4 week Color Change (! E)
Nano 4 Life Bathcare LC#12-T0446	RTU	Ceramic	0.26

Delta-E Explained: Delta-E is used to describe (mathematically) the distance between two colors, (color of unlaundered fabric and color after laundering of the fabric). To calculate the delta-E of any two colors, you need to know their L,a,b values.
The average, casual viewer can notice the difference between two colors that are 5-6 delta-E apart. A trained eye is capable of differentiating two colors that are closer to 3-4 delta-E apart.

TDResearch

!

Tested by: _____
Lab Supervisor

Approved by: _____
Technical Manager

The descriptions, data and statements contained herein are based upon our research and/or of others and are believed to be accurate. No guarantee of their accuracy is made however, and unless expressly stated in a written contract, the product(s) discussed herein are sold without conditions or warranties expressed or implied. Readers are advised to make their own tests to determine the suitability of any products or formulations described herein for their particular purposes. Nothing contained herein shall be construed as a recommendation to use or as a license to operate or to infringe on any existing patent. In no case shall the descriptions, data and statements contained herein be considered a part of our terms and conditions of sale.

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Test Results of Nano diamond 4car paint

Nano4 life.co

Thickness/DFT	Hardness	Abrasion /1000 C
Blank	6 H	32 mg
A 1.1500 nm	12 H	15 mg
B 2 1500 nm	12 H	18 mg
3. 500 nm	9 H	21 mg

SPC Director

Dr. Maher El-Sockary

28.10.20

١ ش أحمد الزمر - مدينة نصر - القاهرة تليفون : ٢٢٧٤٧٩١٧ - ٢٢٧٤٧٨٤٧ (٢٠٢+) فاكس : ٢٢٧٤٧٤٣٣ (٢٠٢+) الرقم البريدى : ١١٧٢٧
1, Ahmed El-Zomor St., Nasr City, Cairo, Egypt. Tel: (+202) 22747917 / 22747847 Fax: (+202) 22747433 P.O.: 11727
www.epri.sci.eg E-mail: research@epri.sci.eg

Work Order	3109.1_Rev1
Setup-Code	180611-10290-2801-01

Test Report

JIS Z 2801:2012 (Mod)

Antimicrobial products – Test for antimicrobial activity and efficacy

Test Object:

Coated Leneta-Foil vs. E. coli DSM 1576

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The result apply only to the samples tested.

Report on Findings

Client:
Address:
NANO4LIFE EUROPE L.P.
Vouliagmenis Ave. 318
Ag. Dimitros – 173 43
Athens/Greece

Work order no.: 3109.1_Rev1

Test object: Coated Leneta-Foil vs. E. coli DSM 1576

Sample description: Coated Foil

Date of receipt of sample: 08.06.2018

Type of test: JIS Z 2801:2012 Antimicrobial products – Test for antimicrobial activity and efficacy

Test Germ: Escherichia coli DSM1576 ATCC8739 ISML CC 02/023

Test laboratory: QualityLabs BT GmbH

Address: Neumeyerstrasse 46a
90411 Nuremberg, Germany

Setup-Code: 180611-10290-2801-01

Sample material: Leneta-Foil

No. of pages in report: 7

Report on findings to the client:
Place and date of preparation: Nuremberg, 17.9.2018
Recipient: NANO4LIFE EUROPE L.P.
Revision of the sample report from 14.9.2018

Laboratory Director:

Harald Gerauer, Laboratory Director
QualityLabs BT GmbH

Released:

Markus Zehe, Managing Director
QualityLabs BT GmbH

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Declaration on Quality Assurance

This investigation was performed and supervised according to the standard operating procedure “SOP zu JIS Z 2801:2012 (Mod)" by QualityLabs BT GmbH. The laboratory and process are continually monitored by independent, external authorities, as well as by internal audits.

Archiving

A copy of the test report, a protocol of the measurement as well as the accompanying correspondence and business records are archived by QualityLabs BT GmbH. The retention period is at least 10 years.

Test description

Anti-bacterial activity is determined in accordance with a modified version of JIS Z 2801:2012.

During the test, a thin liquid-film containing the bacteria (1.25×10^4 CFU / cm^2) is applied directly to the test sample (Standard: 5 cm x 5 cm). To avoid desiccation a foil (Standard: 4cm x 4cm, Stomacher Bags) is applied. Immediately after inoculation, the bacteria from the reference sample are separated from the sample and the enveloping foil surfaces using ultrasound and vortex devices and the number of viable germs (CFU – colony-forming units) is determined (t_0 value). A further set of reference samples and samples given anti-microbial treatment is incubated with bacteria in a liquid-film and the enveloping foil in a damp environment at 37°C. After 24 hours, the bacteria are separated from the sample surfaces using ultrasound and vortex devices and the number of viable germs is determined (t_{24} value).

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Assessment of antimicrobial activity

A logarithmic germ reduction of **≥ 3 log scales** of the antimicrobial sample in comparison to the respective reference is used as assessment criterion to pass the antimicrobial test.

Germ reduktion [log scales]	Antibacterial activity
< 3	Not sufficient antimicrobial activity
≥ 3	Sufficient antimicrobial activity

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References to Testconditions

Testconditions		
Sample size	25	cm^2
Foil size	16	cm^2
Volume Inoculum	400	µl
Sample cleaning	Isopropanol	-

References to deviations, preincubations, special test conditions

NONE

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Work Order	3109.1_EN
Setup-Code	180611-10290-2801-01

Test Results

	Sample Name	Sample Code	t_0 (cells/cm^2)			t_{24} (cells/cm^2)			Reduction [%]	Log Reduction
1	Leneta-Folie P121-10 (Reference)	102900806180001	9.0 x 10^4	1.1 x 10^5	1.1 x 10^5	5.1 x 10^5	4.1 x 10^5	5.3 x 10^5	-	-
2	NANO4-CLEAN/PRIME NANO4-HYGIENE LIFE	102900806180002				< 1.0 x 10^1	< 1.0 x 10^1	< 1.0 x 10^1	**> 99.99**	**> 4**

*see “Interpretation of Results”, page 6

Test strain	*Escherichia coli DSM1576 ATCC8739 ISML CC 02/023*
Initial cell count inoculum / cm^2	**1.25 x 10^4**
Initials of the editor	JJ
Measurement ended on	Jun-15-2018

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The result apply only to the samples tested.

Work Order	3109.1_EN
Setup-Code	180611-10290-2801-01

Comments on test objects

NONE

Interpretation of the results based on the measurements

NONE

Editor: Mrs. Jovanovic ____ **Crosschecked:** Mr. Shendi____

References

JIS Z 2801:2012 Antimicrobial products – Test for antimicrobial activity and efficacy

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The result apply only to the samples tested.

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Testing the virucidal activity of *" NANO4-HYGIENE LIFE"*

Examination of test surfaces equipped with a virucidal active coating using a praxis-near carrier test system following the RKI-Richtlinie (1995) as well as ISO 21702:2019 against the ***Transmissible Gastroenteritis Virus (TGEV-Coronavirus)*** - Test run S2 dated 11./12.03.2020

Short report: screening test S2

by
PD Dr. Olaf Thraenhart and Dr. Christian Jursch

Test period:	in March 2020
Principal:	NANO4LIFE EUROPE L.P. Vouliagmenis Ave. 318, Ag. Dimitrios - 173 43 Athens / Greece

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Principal: NANO4LIFE EUROPE L.P.
Vouliagmenis Ave. 318,
Ag. Dimitrios - 173 43
Athens / Greece

Products:

- Test surfaces: *Leneta®* foil, with the dimensions of 1,6 cm x 6 cm
- 1. test item: test surfaces coated on one side with *NANO4-HYGIENE LIFE* (containing the active component[s])
- 2. test item: uncoated test surfaces (or coated w/o the active component[s])

Test parameter:

- Test conditions: T = 25 °C and 90 % r.LF
- Protein load: no additional protein load; the virus material (cell culture supernatant) was spread onto the surface(s) w/o any further manipulation/alteration
- Volume to square ratio: 25 µL/cm²
- Virus suspension covered with foil (LDPE, 50 µm) with the dimensions 1,2 x 5 cm (6 cm²)
- Incubation: 1h, 8h and 24h in a climate chamber KBF 115 (Fa Binder)

Test system:

- Transmissible Gastroenteritis Virus of Swine (TGEV-Coronavirus); strain: Toyama 36 [used in test as the model virus for SARS-CoV]
  (Origin: Virusbank of the Friedrich Löffler-Institute, Insel Riems, Germany)
- ST75/2 cells (foetal testis cells of swine)
  (Origin: Robert Koch-Institute, Berlin, Germany)

Test procedure:

- The test was performed following a. RKI-Richtlinie (1995) as well as b. ISO 21702:2019
- Test principle: quantitative virucidal carrier test at T = 25 °C and 90 % r.LF (climate chamber)
- the test was performed w/o (additional) protein load

***Tab. 1:* Product samples tested**

No.	Product (s)	Storage conditions [1]
#1	Test item / coated with *NANO4-HYGIENE LIFE* (containing the virucidal active component(s) / „test sample“)	at RT
#2	Test item / uncoated (or coated w/o the virucidal active component(s) / „control sample“)	at RT

[1] = *access limited*

Test results:

Observations:

- The test surfaces were largely wetable by the aqueous virus suspension; thus, a more or less uniform liquid film could be produced by using glass spatulas.
- After covering the virus with the LDPE foil, the virus material remained stable as a film over the entire observation period and did not dry out. However, a volume reduction was recorded.

Tab. 2.1: Virus control *(Virus titration by limiting dilution)*

Sample	VK-1a	VK-1b	VK-2a	VK-2b	VK-3a	VK-3b
	Virus control / 1 h		Virus control / 8 h		Virus control / 24 h	
Titer/Test vol. (lg ID_{50})	4,2	4,8	4,05	3,9	2,25	2,85
av. virus titer ± K (95%) [1]	**5,50 ± 0,37 / 1 mL**		**4,98 ± 0,35 / 1 mL**		**3,55 ± 0,37 / 1 mL**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476

Tab. 2.2: Virus inactivation *(Virus titration by limiting dilution)*

Sample	In-1a	In-1b	In-2a	In-2b	In-3a	In-3b
	Inactivation / 1 h		Inactivation / 8 h		Inactivation / 24 h	
Titer/Test vol. (lg ID_{50})	3,6	3,45	1,35	1,2	≤ 0,30	≤ 0,30
av. virus titer ± K (95%) [1]	4,53 ± 0,22 / mL		2,28 ± 0,29 / mL		≤ 1,30 / mL	
Reduction [2] (lg ID_{50} ± K [95%])	**0,97 ± 0,43**		**2,70 ± 0,46**		**≥ 2,25 ± 0,37**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476
[2] = Virus reduction: lg ID_{50} of virus input (virus control) minus lg ID_{50} of sample (at the given time point)

Virus inactivation: *(cf. Tab. 2)*

- When the virus material is distributed onto a surface a certain virus titer reduction could be observed with almost all viruses. This is driven by time and do also occur without any other influence. This is also true for the test virus used in the present testing. After presentation over 8 h and 24 h on the test surface a titer reduction of 0,5 Log was evident after 8 h and about 2 Log after 24 h (cf. tab. 2.1). It should be noted, however, that this reduction can be judged as very low when compared to 1). the general tenacity of coronaviruses and b). other viruses (even non-enveloped viruses).
- In order to assess the virus inactivating capacity of the coating under test as a single factor an individual virus input control was analysed at each time point tested. With the amount of input virus at a given time point (cf. tab. 2.1) and with the correspondent amount of remaining test virus (cf. tab. 2.2) the virus reduction factor can be determined.
- After the incubation time was due and under the test conditions specified above the virus reduction factor associated with the coating containing the active component amounted to RF = 0,97 ± 0,43 after 1 h, to RF = 2,70 ± 0,46 after 8 h and to RF ≥ 2,25 ± 0,37 after 24 h (cf. Tab. 2.2). It should be noted that after 24 h no residual test virus was detectable.

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Conclusions:

- The virus film applied on the test items and covered with the LDPE-foil was stable over the entire observation period. This means that the virus film remained in the liquid state even at the end of the longest exposure time (24 h) and was not dried. Thus, a continuous contact between the virus material and the surface of the test carrier was ensured all over the observation period and a distribution of the virus material in the liquid phase driven by diffusion was given.
- After t = 1 h a virus reduction of 0,97 Log was recorded (corresponding to 90 % of inactivation) and after t = 8 h the virus reduction amounted to RF = 2,7 (corresponding to 99,8 % of inactivation). Due to technical reasons demonstration of the virus reduction was limited to RF $\geq$ 2,25 after 24 h.
- The data obtained allow the conclusion that there is a virus reduction that can be attributed to the coating containing the active component(s). With the present testing a good virus inactivating activity of the virucidal coating under test was demonstrated against the TGEV-Coronavirus (as the model virus for the SARS-CoV).
- It should also be mentioned that the conditions of ISO 21702 provide for a higher incubation temperature than that used in S1 (25 vs. 21 ° C).
- The virus reduction obtained with t = 8 h suggests that at the incubation time t = 24 h a higher virus reduction is evident than could be demonstrated with the endpoint titration method. Here, virus titer determination using the *Large Volume Plating (LVP)* can possibly provide an improved statement.

Luckenwalde, 28th of April 2020

Dr. Ch. Jursch
(GF und Laborleiter Eurovir)

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Eurovir® Hygiene-Labor
Antivirale Validierung & Rabies

Testing the virucidal activity of *"NANO4-HYGIENE LIFE"*

Examination of test surfaces equipped with a virucidal active coating using a praxis-near carrier test system following the RKI-Richtlinie (1995) as well as JIS Z 2801 (2010) against *Influenza A Virus (H1N1)* - Test run S1 dated 20./21.01.2020

Short report: screening test S1

by
PD Dr. Olaf Thraenhart and Dr. Christian Jursch

Test period:	in January 2020
Principal:	NANO4LIFE EUROPE L.P. Vouliagmenis Ave. 318, Ag. Dimitrios - 173 43 Athens / Greece

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Principal: NANO4LIFE EUROPE L.P.
Vouliagmenis Ave. 318,
Ag. Dimitrios - 173 43
Athens / Greece

Products:

- Test surfaces: *Leneta®* foil, with the dimensions of 1,6 cm x 6 cm
- 1. test item: test surfaces coated on one side with *NANO4-HYGIENE LIFE* (containing the active component[s])
- 2. test item: uncoated test surfaces (or coated w/o the active component[s])

Test parameter:

- Test conditions: T = 21 °C and 60 % r.LF
- Protein load: no additional protein load; the virus material (cell culture supernatant) was spread onto the surface(s) w/o any further manipulation/alteration
- Volume to square ratio: 20 µL/cm²
- Virus suspension covered with foil (LDPE, 50 µm) with the dimensions 1,2 x 5 cm (6 cm²)
- Incubation: 1h, 8h and 24h in a climate chamber KBF 115 (Fa Binder)

Test system:

- Influenza A Virus; H1N1; strain: New Caledonia
  (Origin: Chiron Behring, Marburg, Germany)
- MDCK-cells (kidney cells from African green monkey [Cercopethecus aethiops])
  (Origin: Robert Koch-Institut, Berlin, Germany)

Test procedure:

- The test was performed following a. RKI-Richtlinie (1995) as well as b. JIS Z 2801 (2010)
- Test principle: quantitative virucidal carrier test at T = 21 °C and 60 % r.LF (climate chamber)
- the test was performed w/o (additional) protein load

Tab. 1: ***Product samples tested*** *(as received at 13.01.2020)*

No.	Product (s)	Storage conditions [1]
#1	Test item / coated with *NANO4-HYGIENE LIFE* (containing the virucidal active component(s) / „test sample“)	at RT
#2	Test item / uncoated (or coated w/o the virucidal active component(s) / „control sample“)	at RT

[1] = *access limited to the personnel of Eurovir*

Test results:

Observations:

- The test surfaces were largely wetable by the aqueous virus suspension; thus, a more or less uniform liquid film could be produced by using glass spatulas.
- After covering the virus with the LDPE foil, the virus material remained stable as a film over the entire observation period and did not dry out. However, a volume reduction was recorded.

Tab. 2.1: Virus control *(Virus titration by limiting dilution)*

Sample	VK-1a	VK-1b	VK-2a	VK-2b	VK-3a	VK-3b
	Virus control / 1 h		Virus control / 8 h		Virus control / 24 h	
Titer/Test vol. (lg ID_{50})	3,15	3,3	3,45	3,15	2,7	3,15
av. virus titer ± K (95%) [1]	**3,23 ± 0,36 / 100 µL**		**3,30 ± 0,33 / 100 µL**		**2,93 ± 0,34 / 100 µL**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476

Tab. 2.2: Virus inactivation *(Virus titration by limiting dilution)*

Sample	In-1a	In-1b	In-2a	In-2b	In-3a	In-3b
	Inactivation / 1 h		Inactivation / 8 h		Inactivation / 24 h	
Titer/Test vol. (lg ID_{50})	3,45	3,15	2,4	2,4	1,2	1,2
av. virus titer ± K (95%) [1]	3,30 ± 0,32		2,40 ± 0,29		1,20 ± 0,33	
Reduction [2] (lg ID_{50} ± K [95%])	**-0,07 ± 0,48**		**0,90 ± 0,44**		**1,73 ± 0,47**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476
[2] = Virus reduction: lg ID_{50} of virus input (virus control) minus lg ID_{50} of sample (at the given time point)

Virus inactivation: *(cf. Tab. 2)*

- When the virus material is distributed onto a surface a certain virus titer reduction could be observed with almost all viruses. This is driven by time and do also occur without any other influence. This is also true for the test virus used in the present testing. After presentation over 24 h on the test surface a titer reduction of 0,3 Log was evident (cf. tab. 2.1). It should be noted, however, that this reduction can be judged as very low when compared to 1). the general tenacity of influenza virus and b). other viruses (even non-enveloped viruses).
- In order to assess the virus inactivating capacity of the coating under test as a single factor an individual virus input control was analysed at each time point tested. With the amount of input virus at a given time point (cf. tab. 2.1) and with the correspondent amount of remaining test virus (cf. tab. 2.2) the virus reduction factor can be determined.
- After the incubation time was due and under the test conditions specified above the virus reduction factor associated with the coating containing the active component amounted to RF = -0,07 ± 0,48 after 1 h, to RF = 0,90 ± 0,44 after 8 h and to RF = 1,73 ± 0,47 after 24 h (cf. Tab. 2.2).

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Conclusions:

- The virus film applied on the test items and covered with the LDPE-foil was stable over the entire observation period. This means that the virus film remained in the liquid state even at the end of the longest exposure time (24 h) and was not dried. Thus, a continuous contact between the virus material and the surface of the test carrier was ensured all over the observation period and a distribution of the virus material in the liquid phase driven by diffusion was given.
- The data obtained allow the conclusion that there is a virus reduction that can be attributed to the coating containing the active component(s).
- The virus reduction rate progresses rather slowly over the observation period. No virus inactivation was detectable after a contact time of 1 hour and after 8 hours the virus reduction was approximately 1 Log (corresponding to a virus reduction of approximately 90%). After 24 hours virus reduction reached approximately 2 Log (corresponding to a reduction of approximately 99%).
- The observed virus-inactivating effect of the coating (containing the active component[s]) was determined using the *influenza A virus* as the test virus. This virus is in general considered to be inactivated easily, even when compared with other enveloped virus. This means that the observed virus inactivation capacity of the tested coating, as obtained with *influenza A virus,* cannot be transferred necessarily to other viruses. This also applies to other enveloped viruses.

Luckenwalde, 28th of April 2020

Dr. Ch. Jursch
(GF and Laboratory manager of Eurovir)

NANO4LIFE EGYPT

21Madfa'eia buildings
beside City Stars - Nasr city

Tel: 01069307000 - 0222914922
Nano4life.eg@gmail.com
nano4life.egypt
www.nano4life.co