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ASX: NVU

Aircraft Laminates to Incorporate Nanoshield™ Technology

Nanoveu Limited ("**Nanoveu**" or the **"Company"**) (**ASX: NVU),** a company specialising in modern, cutting-edge nanotechnology, advises that it has completed a research collaboration with A*STAR[1] to develop a new product category in anti-flammable laminates for the aviation industry, to which the Company is now adding its Nanoshield™ antiviral technology.

Highlights

- **Successful research program undertaken by A*STAR and Nanoveu to develop aviation laminate**
- **Developed laminate has successfully passed all pertinent evaluations for use in commercial airlines, including OSU Heat Release, Anti-Smoke, and Anti-Flame tests (see Appendix 1)**
- **Opportunity to expand Nanoshield™ treated laminates to additional transportation markets**

Nanoveu has completed research collaboration with the Institute of Material Science, a division of Singapore's largest research institution – A*STAR, to develop a new anti-flammable laminate product, with a particular focus on the aviation industry. The collaboration was initiated by A*STAR in August 2021 and drew on Nanoveu's background in developing and commercialising nano imprint lithography products and its co creator of its EyeFly3D products.

Nanoveu actively assisted in development of the industry compliant laminates, identifying and sourcing suitable materials, price negotiation and identification of capable and reliable production facilities to manufacture the aviation laminates. Nanoveu engineers participated and actively managed the testing process to meet vigorous Federal Aviation Administration **(FAA**) standards including FAR 25.853[2], Airbus and Boeing Standards. The Company's prototypes passed all required safety testing parameters. Testing was undertaken by Jamco USA[3], A*STAR's nominated testing facility accredited by the FAA and European Union Aviation Safety Agency (**EASA**) to produce, record, and document data to be used for FAA and EASA certification programs.

Whilst certification equivalent testing was completed by Jamco USA in September 2022, A*STAR subsequently conducted additional tests in their own facility. This included hardness and tear testing (ISO 4674-1), abrasive testing (ASTM D 4060-1) and UV stability testing (ASTM G154).

Certification was not sought for the prototypes, however, upon customer validation final samples will be submitted for formal certification.

The development of this new product category is an on going work in process and discussions and correspondence are current and ongoing. A*STAR continues to meet with Nanoveu to map out current issues and continued development.

Nanoveu is of the view that disclosure of the Aviation Laminate project is now appropriate as there is now a clear path to commercialization, and earlier disclosure was considered speculative as it was in its R&D stage of development.

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[1] A*STAR – Singapore Agency for Science, Technology and Research, https://www.a-star.edu.sg

[2] Standard of the Federal Aviation Administration (FAA) for determining the flammability of aircraft seat cushions

[3] https://www.jamco-america.com/Capabilities/TestingServices

The prototypes will soon have the Company's own proprietary antiviral layer added, by replicating results in its previous PVC laminates that had achieved anti-viral and bacterial efficacy of 99.99%[4]. Establishing the core anti flammable layers was an important first step as it will allow the company to develop an almost permanent antiviral solution to the aviation market place for these laminates.

The development underscores progress in Nanoveu's strategy to create a full range of effective self-disinfecting solutions and expands the Nanoshield™ range of products – post pandemic.

The Company is now focussing on developing texturing and colour variations for this new product category.

Nanoveu's Managing Director Mr Alfred Chong, said *"Nanoveu plans to cater to all aspects of Aircraft Laminates, leveraging on its decade long experience in nano imprint lithography to enhance these high value products in conjunction with its more recent experience with antiviral laminates. The Company is also assessing the application of its laminates for the large secondary markets of electric vehicles and high-speed trains."*

Aircraft Laminates

In the 1960s the aviation industry introduced cabin fire safety standards that included stringent fire, smoke and toxicity (**FST**) standards. With this, came the development of decorative laminates - a cost-effective material that met FST standards.

Decorative laminates enabled airlines and aircraft original equipment manufacturers to meet stringent safety standards as these laminates reduced the likelihood of replacing expensive interior components and the need for preparing surfaces for painting[5].

The demand for decorative laminates continues to be fuelled by the production of next generation aircrafts, rising aircraft fleets and the modernization of existing fleets' cabin interiors[5].

The Market Size for the Aircraft laminate industry was USD $299 million in 2019, and is expected to grow to USD $412 million in 2027, with a CAGR of 4.72%[6].

This announcement has been authorised for release by the Board of Directors.

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About Nanoveu Limited

Nanoveu is a company specialising in modern, cutting-edge nanotechnology in reducing contagious transmissions on high touch points extending to immersive vision-based entertainment and development of allied products. https://www.nanoveu.com/

[4] See ASX Announcements of 15 April 2020, 5 May 2020, 25 May 2020, 18 February 2021 ,and 28 July 2021 for the testing performed and the results.
[5] PR Newswire, 2023, "Global Aircraft Decorative Laminates Markets 2013-2018 & 2019-2024 Featuring Isovolta, Schneller, Dunmore, E. I. Du Pont de Nemours and Co., and The Boeing Company"
[6] Maximize Market Research, 2023, "Global Aircraft Decorative Laminates Market"

Nanoshield™ - is a film which uses a patented polymer of Cuprous embedded film to self-disinfect surfaces. Nanoshield antiviral protection which is available in a variety of shapes and forms, from mobile screen covers, to mobile phone cases and as a PVC commercial film, capable of being applied to a number of surfaces such as doorhandles and push panels. The perfectly clear plastic film contains a layer of charged copper nanoparticles which have antiviral and antimicrobial properties. This technology is also being applied to fabric applications targeting use in the personal protective equipment sector.

EyeFly3D™ - is a film applied to digital displays that allowed users to experience 3D without the need for glasses on everyday mobile handheld devices.

Customskins - are vending machines capable of precisely applying screen covers to mobile phones with an alignment accuracy of 150 microns.

EyeFyx - currently in research and development stage, EyeFyx is a vision correction solution using hardware and software to manipulate screen output addressing long-sightedness without the need to wear reading glasses.

Forward Looking Statements

Statements regarding plans with respect to Nanoveu's projects and products are forward looking statements. There can be no assurance that Nanoveu's plans for its projects or products will proceed as expected and there can be no assurance of future sales.

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Appendix 1

FLAMMABILITY TEST DATASHEET

Jamco

DOCUMENT #:	TEST LOCATION:	MANUFACTURER:	MATERIAL IDENTIFICATION:
MFG. OR JOB #: PO- 2022-0901	JAMCO AMERICA 1018 80th Street S.W Everett, WA 98203	Nanoveu	Poxxx flam

DESCRIPTION: flammability — DATE: 9/23/2022 — REV: A

TESTED BY: B.Edgerton BE — WITNESSED BY: N/A — FLAME TEMP: 1850°F

CONDITIONING SCHEDULE-IN/OUT DATE & TIME

IN DATE: 9/21/2022 — IN TIME: 9:00am — OUT DATE: 9/23/2022 — OUT TIME: 9:30am

TEST REQUIREMENTS: ☒14 CFR § 25.853(a) or ☐ABD0031
TEST METHOD: ☒AIRCRAFT MATERIALS FIRE TEST HANDBOOK DOT/FAA/AR-00/12
☐AITM2.0002 IF2 ☐AITM2.0003 IF2 ☐AITM2.0004 IF1 ☐AITM2.0005 IF1A

IGNITION TIME & MATERIAL POSITION		EXTING TIME (SEC)	BURN LENGTH	DRIP EXTING TIME (SEC)	BURN RATE	FLAME PENE-TRATION	AFTER GLOW (SEC)
☒ F1	60 SEC. VERTICAL	15 SEC	6 IN	3 SEC	-	-	-
☐ F2	12 SEC. VERTICAL	15 SEC	8 IN	5 SEC	-	-	-
☐ F3	15 SEC. HORIZONTAL	-	-	-	2.5 IN/MIN	-	-
☐ F4	15 SEC. HORIZONTAL	-	-	-	4.0 IN/MIN	-	-
☐ F5	30 SEC. 45°	15 SEC	-	-	-	NONE	10 SEC
☐ F6	30 SEC. 60°	30 SEC	3 IN	3 SEC	-	-	-

SPECIMEN SIDE A	EXTING TIME (SEC)	BURN LENGTH (INCH)	DRIP EXTING TIME (SEC)	BURN TIME(SEC)	BURN RATE (IN/MIN)	FLAME PENE-TRATION	AFTER GLOW (SEC)
1	0	3.4	ND				
2	0	3.8	ND				
3	0	3.7	ND				
AVERAGE	0	3.6	No Drip				

TEST RESULTS: PASS ☒ FAIL ☐

AMOUNT OF SMOKE: NONE ☐ SLIGHT ☒ MODERATE ☐ HEAVY ☐ — CONSTRUCTION THICKNESS: .02 (inches)

PLANNING AND MANUFACTURING INSTRUCTIONS

1. SPECIMEN SIZE 3 X 12 INCH
2. IF MATERIAL IS NOT AVAILABLE IN 3 X 12 INCH SPECIMEN, ACCEPTABLE TO TEST ACTUAL PART OR, IF MATERIAL IS AN EXTRUSION WITH WIDTH LESS THAN 3 INCHES, ACCEPTABLE TO TEST A 12 INCH LENGTH.
3. TOLERANCES
   SPECIMEN SIZE: +/- 0.1 INCH
   THICKNESS: INDIVIDUAL LAYER TOLERANCE PER MATERIAL SPECIFICATION
4. QUANTITY (4)
5. REFERENCE P/N

MATERIAL SKETCH

LAYER	MATERIAL DESCRIPTION	LOT #
	Poxxx- flamm	

CONFORMITY INSPECTION REQUIREMENTS:
1. Confirm all specimens are manufactured in accordance with this Test Datasheet.
2. MFG original Test Datasheet should be filed by QA inspector.
3. Inspected specimens shall be carried to the flammability test lab. Do not put test samples into inventory.

OSU HEAT RELEASE TEST DATASHEET

Jamco

DOCUMENT #:	TEST LOCATION:	MANUFACTURER:	MATERIAL IDENTIFICATION:
MFG. OR JOB #: PO- 2022-0901	JAMCO AMERICA 1018 80th Street S.W Everett, WA 98203	Nanoveu	Poxxx- Heat release

DESCRIPTION: Initial release. — DATE: 9/22/2022 — REV: A

TESTED BY: B.Edgerton BE — WITNESSED BY: N/A — HEAT FLUX: 3.49 3.5+/-0.05W/cm² — CALIBRATION CONSTANT: 0.2477

CONDITIONING SCHEDULE-IN/OUT DATE & TIME

IN DATE: 9/21/2022 — IN TIME: 9:00am — OUT DATE: 9/22/2022 — OUT TIME: 9:30am

TEST REQUIREMENTS: ☒14 CFR § 25.853(d) or ☐ABD0031
TEST METHOD: ☒AIRCRAFT MATERIALS FIRE TEST HANDBOOK DOT/FAA/AR-00/12 CHAPTER 5
☐ AITM 2.0006 ISSUE 3

TEST REQUIREMENTS	MAXIMUM 65	MAXIMUM 65
SPECIMEN SIDE A	TOTAL HEAT RELEASE AFTER 2 min. Q (kW-min/m²)	PEAK HEAT RELEASE RATE DURING 5 min. dQ/dt (kW/m²)
1	58.8	54.9
2	61.2	52.7
3	48.3	48.8
AVERAGE	56.1	52.1
TEST RESULTS	PASS ☒	FAIL ☐

CONSTRUCTION THICKNESS: .02(inches)

PLANNING AND MANUFACTURING INSTRUCTIONS

1. SPECIMEN SIZE 5.94 X 5.94 INCH
2. TOLERANCES
   SPECIMEN SIZE: ± 0.06 INCHES
   THICKNESS: INDIVIDUAL LAYER TOLERANCE PER MATERIAL SPECIFICATION
3. QUANTITY (4)
4. REFERENCE P/N

MATERIAL SKETCH

LAYER	MATERIAL DESCRIPTION	LOT #
	Paxxx-heat release	

CONFORMITY INSPECTION REQUIREMENTS:
1. Confirm all specimens are manufactured in accordance with this Test Datasheet.
2. MFG original Test Datasheet should be filed by QA Inspector.
3. Inspected specimens shall be carried to the flammability test lab. Do not put test samples into inventory.

SMOKE DENSITY AND TOXIC GAS ANALYSIS TEST DATASHEET

Jamco

DOCUMENT #:	TEST LOCATION:	MANUFACTURER:	MATERIAL DESCRIPTION:
MFG. OR JOB #: PO- 2022-0901	JAMCO AMERICA 1018 80th Street S.W Everett, WA 98203	Nanoveu	Poxxx- smoke and toxic

DESCRIPTION: smoke and toxic gas — DATE: 9/22/20022 — REV: A

TESTED BY: B.Edgerton BE — WITNESSED BY: N/A — HEAT FLUX: 2.46 W/cm2

CONDITIONING SCHEDULE-IN/OUT DATE & TIME

IN DATE: 9/21/2022 — IN TIME: 9:00am — OUT DATE: 9/23/2022 — OUT TIME: 9:30am

SMOKE DENSITY TEST METHOD
☐BSS7238 ☐AITM 2.0007 ISSUE 3

TOXICITY TEST METHOD
☐BSS7239 ☐AITM 3.0005 ISSUE 2 (WET ANALYSIS)

TEST REQUIREMENTS (MAX AVERAGE)

MAX D_s DURING 4 MIN PERIOD <200*
*For Airbus, see ABD0031 §7.3

MAX D_s DURING 4 MIN PERIOD
☐FLAME ☐NON FLAME

TEST REQUIREMENTS (MAX ALLOWED)

Boeing	CO N/A HF 200 ppm	HCN 150 ppm HCl 500 ppm	NO/NO_2 100 ppm SO_2/H_2S 100 ppm
Airbus	CO 1000 ppm HF 100 ppm	HCN 150 ppm HCl 150 ppm	NO/NO_2 100 ppm SO_2/H_2S 100 ppm

MAXIMUM ALLOWED

SAMPLE SIDE A	SPECIFIC OPTICAL DENSITY AFTER 4 MINUTES D_s	SAMPLE #	CO	HF	HCL	HCN	SO_2/H_2S	NO/NO_2
1	222	1	N/A	3	0	0	12	2
2	191	2	N/A	3	0	0	15	2
3	182	3	N/A	N/A	N/A	N/A	N/A	N/A
AVG	198	AVG						
PASS ☒	FAIL ☐	PASS ☒				FAIL ☐		

CONSTRUCTION THICKNESS (INCHES): .02in

PLANNING AND MANUFACTURING INSTRUCTIONS

1. SPECIMEN SIZE 2.9 X 2.9 INCH
2. TOLERANCE
   SIZE: +/- 0.06 INCHES
   THICKNESS: INDIVIDUAL LAYER TOLERANCE PER MATERIAL SPECIFICATION
3. QUANTITY (4)
4. REFERENCE P/N

MATERIAL SKETCH

LAYER	MATERIAL DESCRIPTION	LOT #
	Poxxx- smoke and toxic	

CONFORMITY INSPECTION REQUIREMENTS:
1. N/A No conformity inspection required. Engineering qualification testing only, not for certification purposes.