

ASX RELEASE

7 March 2023

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*STAR¹ 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 25.853², Airbus and Boeing Standards. The Company’s prototypes passed all required safety testing parameters. Testing was undertaken by Jamco USA³, 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.

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 painting⁵.

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 interiors⁵.

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.

Appendix 1

FLAMMABILITY TEST DATASHEET									
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				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 ☐ AB00031									
TEST METHOD: ☒ AIRCRAFT MATERIALS FIRE TEST HANDBOOK DOT/FAA/AR-00/12									
☐ ASTM D 2007-12 ☐ ASTM D 2007-12 ☐ ASTM D 2007-12 ☐ ASTM D 2007-12									
IGNITION TIME & MATERIAL POSITION		EXTING TIME (SEC)		BURN LENGTH (INCH)		DRIPTIME (SEC)		BURN RATE (IN/MIN)	
☒ 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	
☐ F6 30 SEC. 60°		80 SEC		3 IN		3 SEC		10 SEC	
SPECIMEN SIDE A		EXTING TIME (SEC)		BURN LENGTH (INCH)		DRIPTIME (SEC)		BURN RATE (IN/MIN)	
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					MATERIAL SKETCH				
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									
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									
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				WITNESSED BY: N/A		HEAT FLUX: 3.49		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 ☐ AB00031									
TEST METHOD: ☒ AIRCRAFT MATERIALS FIRE TEST HANDBOOK DOT/FAA/AR-00/12 CHAPTER 5									
TEST REQUIREMENTS		MAXIMUM GS				MAXIMUM GS			
SPECIMEN SIDE A		TOTAL HEAT RELEASE AFTER 2 min. Q (kW-min/m²)				PEAK HEAT RELEASE RATE DURING 5 min. Q (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					MATERIAL SKETCH				
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									
LAYER	MATERIAL DESCRIPTION				LOT #				
	Poxxx-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												
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: 9/22/2022		REV: A						
TESTED BY: B. Edgerton				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					TOXICITY TEST METHOD							
☐ BS57238 ☐ ASTM 2.0007 ISSUE 3					☒ BS57238 ☐ ASTM 3.0005 ISSUE 2 (WET ANALYSIS)							
TEST REQUIREMENTS (MAX AVERAGE)					TEST REQUIREMENTS (MAX ALLOWED)							
MAX O ₂ DURING 4 MIN PERIOD <200°					Boeing							
*For Airbus, see AB00031 §7.3					CD N/A							
					HF 200 ppm							
					HCN 150 ppm							
					NO/NO ₂ 100 ppm							
					Airbus							
					CD 1000 ppm							
					HF 100 ppm							
					HCN 150 ppm							
					NO/NO ₂ 100 ppm							
					SO ₂ /H ₂ S 100 ppm							
MAX O ₂ DURING 4 MIN PERIOD ☐ FLAME ☐ NON-FLAME					MAXIMUM ALLOWED							
SAMPLE SIDE A		SPECIFIC OPTICAL DENSITY AFTER 4 MINUTES D _s			SAMPLE #		CO	HF	HCL	HCN	SO ₂ /H ₂ S	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 ☐												
CONSTRUCTION THICKNESS (INCHES): .02in												
PLANNING AND MANUFACTURING INSTRUCTIONS					MATERIAL SKETCH							
1. SPECIMEN SIZE 2.9 X 2.9 INCH												
2. TOLERANCE SIZE: +/- 0.05 INCHES THICKNESS: INDIVIDUAL LAYER TOLERANCE PER MATERIAL SPECIFICATION												
3. QUANTITY (4)												
4. REFERENCE P/N												
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.												