



## NANOCICLA DATASHEET

Chemical name of PLA NANOCICLA: Polylactic acid with copper nanoparticles.

### **Description:**

We use a material reinforced with copper nanoparticles, making it antimicrobial, antibacterial and antiviral.

The PLA NanoCicla filament is easy to print by the user thanks to its reliability and good surface quality. It is made of biodegradable materials. It's suitable for a wide range of applications.

### **Main features:**

The PLA NanoCicla filament offers good tensile strength and surface finish. It can work at high printing speeds and allows the creation of high resolution parts.

Recommended for use in: Household tools (not heavy duty), toy making, educational projects, exhibits, prototyping, architectural models, mechanical parts, industrial parts and also for lost wax casting methods for the creation of metal parts.

### **Filament Specifications:**

Color: Various

Diameter: 1.75 / 0.04mm

Quantity per roll: 1 Kg (350 m approx.)

Extrusion temperature: 190°C - 220°C (Reference values)

Bed temperature: 0°C - 60°C (Reference values)

Print speed: 60mm / sec



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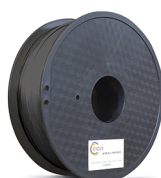
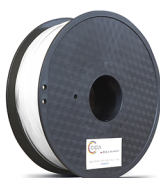
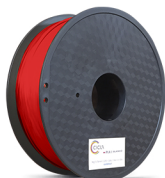
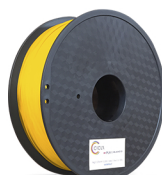
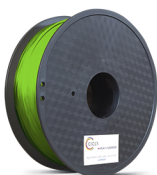
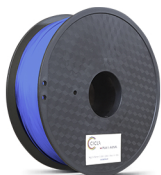
Recommendations: Before starting to print, make a temperature tower and confirm the specifications.

- Mechanical Properties: 3D Printing
- Young's modulus in tensile: 2346.5MPa
- Tensile strength: 49.5MPa
- Flexural strength: 103MPa
- Young's modulus in flexion: 3150GPa
- Impact: 5.1KJ / m2

Recommendations: Avoid prolonged use outdoors or applications in which the printed part is exposed to temperatures of 50 ° C.



## AVAILABLE COLOURS



## ESSAY REPORT

LABORATORY: MICROLABS

CLIENT	CICLA 3D
Attention of:	Mauricio Mellado
Sampling certificate number:	2257
Reception date:	23/06/2020 - 12:25
Date and time of the analysis start:	24/06/2020 - 09:00
Report issue date:	30/06/2020

### Bacterial Efficacy Evaluation

Muestra	NANO CICLA PLA Antimicrobial				
	Concentración Suspensión bacteriana	Concentración 8 horas		Concentración 24 horas	
		Recuento Aerobios Mesófilos	% Eficacia	Recuento Aerobios Mesófilos	% Eficacia
<i>Escherichia coli</i> ATCC 8739	1,1 x 10 <sup>9</sup> ufc/ mL	3,1 x 10 <sup>2</sup> ufc/ mL	99,97181%	1,2 x 10 <sup>0</sup> ufc/ mL	99,98909%

Observations: % Efficacy =  $[(Ni - Np) / Ni] \times 100$  = percentage reduction of microorganisms

Ni = Initial concentration count

Np = Count obtained in product

The reported test results are covered by Microlab SpA Management System accredited under NCh-ISO / IEC 17025 Certificates LE 1392 and LE 1469.

CLIENT	CNV
TO	Luis Garrido
SAMPLING RECORD NO.	2559
SAMPLED BY	Client
DATE OF RECEIPT	17-08-2020 11:20
ANALYSIS START DATE AND TIME	18,7°C
REPORT ISSUE DATE	24-08-2020

**EVALUATION OF ANTIBACTERIAL EFFECTIVENESS**

Micro-organism Inoculated	PLA Nanocida						
Sample/ Time	Initial Concentration	Concentration 4 hours		Concentration 8 hours		Concentration 24 hours	
	Mesophilic aerobic count	Mesophilic aerobic count	% Effectiveness	Mesophilic aerobic count	% Effectiveness	Mesophilic aerobic count	% Effectiveness
<i>Escherichia coli</i> ATCC 8739	1,9x10 <sup>6</sup> ufc/mL	1,2x10 <sup>4</sup> ufc/mL	99,36842%	6,7x10 <sup>3</sup> ufc/mL	99,64736%	1,2x10 <sup>3</sup> ufc/mL	99,93684%
<i>Staphylococcus aureus</i> ATCC 25923	1,3x10 <sup>6</sup> ufc/mL	1,6x10 <sup>5</sup> ufc/mL	87,69230%	9,7x10 <sup>4</sup> ufc/mL	92,53846%	4,6x10 <sup>4</sup> ufc/mL	96,46153%
<i>Candida albicans</i> ATCC 10231	5,8x10 <sup>4</sup> colonies/mL	5,4x10 <sup>3</sup> colonies/mL	90,68965%	1,2x10 <sup>2</sup> colonies/mL	99,79310%	0 colonies/mL	100%

**Technical Observations:**

% Effectiveness=  $[(Ni-Np) / Ni] \times 100$  = percentage reduction of microorganisms

Ni= Initial concentration count

Np= Count obtained in product

**Other Observations:**

Results covered by Microlab SpA accredited Management System NCh-ISO/IEC 17025 LE 1392 and LE 1469 certificates

Microlab SpA.

Fono: 2 322 688 20 Dirección: Tobalaba 13771, Peñalolén [contacto@microlabchile.com](mailto:contacto@microlabchile.com) [www.microlabchile.com](http://www.microlabchile.com)  
Código: REG-025 Elaborado por: Director Técnico Revisado y aprobado por: Encargado de Calidad última revisión: 11/2018 Versión: 1

Strains Used for Test

*Escherichia coli* ATCC 8739

*Staphylococcus aureus* ATCC 25923

*Candida albicans* ATCC 10231

100µl of strain is inoculated

Technical References of Analysis

Method based on ISO 22196 – Measurement of antibacterial activity on plastics and other non-porous surfaces

Sincerely,



Nuria Soler Vila  
Microbiologist  
Technical Director



Montserrat Ruiz Fernández  
Microbiologist  
Laboratory Head



**MICROLab**  
QUALITY • SERVICES

Results valid only for sample analyzed.

This test report may not be fully or partially reproduced.

Microlab SpA.

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Código: REG-025 Elaborado por: Director Técnico Revisado y aprobado por: Encargado de Calidad última revisión: 11/2018 Versión: 1

Santiago, November 16, 2018

## **SPM101 NL Sample Analysis Report**

Maurizio Mellado  
General Manager  
NanoLab Chile

Dear Mr. Mellado,

At your request, I am sending you the results of the analysis of nanoparticle samples corresponding to sample M01. These do not exhibit a well-defined characteristic size but are identified in the nanometric order.

The measurements were made in the laboratory of surfaces and nanomaterials of the Physics Department at the Faculty of Physical Sciences and Mathematics of the University of Chile. The details of this characterization are presented below.

### **Technique used**

A series of topographic images were taken by contact mode AFM under vacuum conditions.

Equipment: SPM1 from Omicron.

PP-CONTR tips: radius of curvature 10 nm and elastic constant 0.02-0.77 N / m.

### **Preparation of sample**

The supplied ones come in powder form. For which a small amount was taken that was diluted, sonicated and placed on a flat substrate and allowed to dry under laboratory conditions.

A silicon wafer was used as the substrate. This substrate was cleaned with 2-propanol and dried with nitrogen gas. The roughness of this substrate was 0.17 nm over areas of 1000x1000 nm<sup>2</sup>.

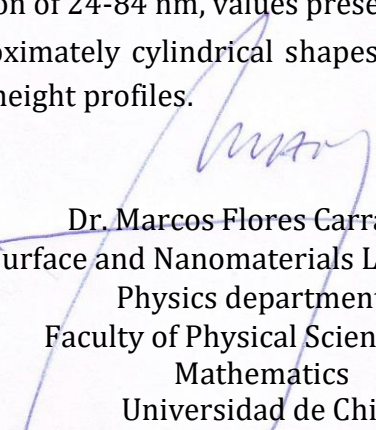
The samples thus prepared were immediately mounted on the microscope.

### **Results**

The particles have a circular disk appearance, as shown in the images included in Figure 1. The images were collected in areas of 1000 x 1000 nm<sup>2</sup> with a resolution of 1024x1024 pixels.

The characteristic mean diameter and height were determined from height profiles drawn on the particles. This value for a count of 49 correctly identified particles gives a population of 12.5 nm in height, with a dispersion of 2.5-50.2 nm and 46 nm in lateral diameter, with a dispersion of 24-84 nm, values presented in Table 1.

The particles have approximately cylindrical shapes, whose measurements have been determined by means of height profiles.



Dr. Marcos Flores Carrasco  
Surface and Nanomaterials Laboratory  
Physics department  
Faculty of Physical Sciences and  
Mathematics  
Universidad de Chile

Annex 1: figures and tables

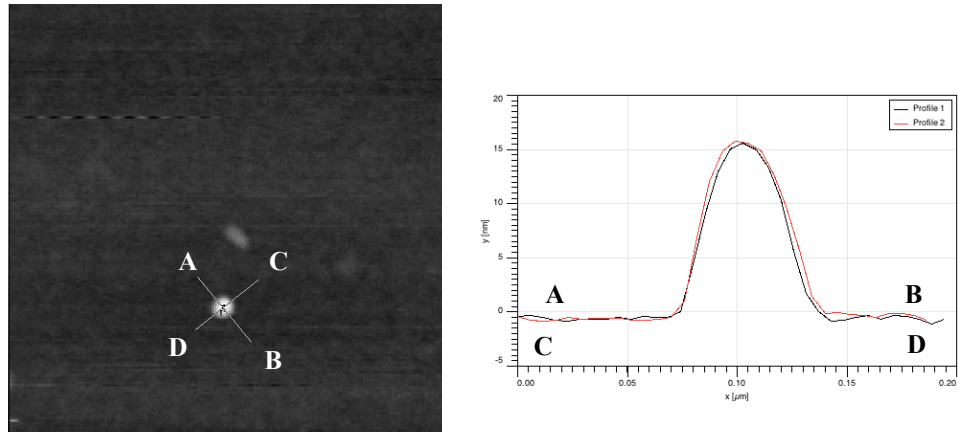


Figure 1: Topographic image of the surface and height profiles through the main axes of a nanoparticle.

Height (nm)	Width (nm)
2.5	30
3.0	35
3.0	26
3.0	50
3.1	31
3.1	36
3.3	30
3.3	34
3.4	27
3.5	24
3.5	30
3.7	42
3.7	41
3.9	47
4.0	29
4.5	57
4.5	45
4.9	32
5.2	58
5.4	28
5.5	29
7.1	52
7.3	47
9.2	48
11.8	35

13.3	35
13.9	41
14.1	38
14.6	44
16	44
18.4	39
18.5	42
23.3	52
23.4	69
24.6	48
25.6	52
27.7	53
28.4	50
30.5	70
30.8	56
31.7	48
32.9	84
35.7	48
36.7	47
37.2	50
37.5	49
39	69
44.4	58
47.2	70
50.2	49

Table 1: Characteristic size values of the different nanoparticles.

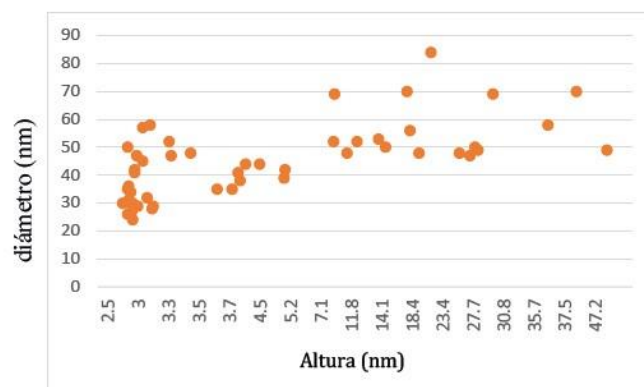


Figure 2: Graph of the lateral diameter as a function of the height of the particles.