POLYDEF
LINE OF BIOCIDAL ADDITIVES FOR POLYMERS

ACTIVE SILVER PROTECTION by POLYDEF

Biocidal additives containing **silver particles** for polymers

POLYDEF Ag+ 3D PLA

PRODUCT DATA SHEET

POLYDEF Ag+ 3D PLA is a polymer granulate with silver (Ag) particles designed for 3D printing (FDM/FFF) and imparts bactericidal and fungicidal properties to the finished prints.

The presence of silver in the protected polymer ensures a biocidal effect by inhibiting the metabolic pathways of microorganisms, contributing to the elimination of sources of unpleasant smells and the extension of the lifetime of the material. The additive is environmentally friendly, does not affect the physical properties of the polymers and does not cause degradation of the protected material. The component provides long-lasting microbiological protection (microbiological efficacy of ≥ 99.98%), as well as enhances the safety and attractiveness of the product. The additive is also very stable at high temperatures and in high humidity compared to traditionally used biocides.

General information

POLYDEF Ag+ 3D PLA provide antimicrobial properties and should not affect the basic colour or surface finish of the product. The active substances do not degrade or leach. The additive is designed to exhibit constant activity throughout the product life cycle.

Test procedure

The analysis is a quantitative test designed to assess the performance of antimicrobial properties. Test samples are incubated with a bacterial suspension for 24 hours at 37°C. The average number of viable bacterial cells and the percentage reduction of the selected microorganism are then calculated.

Microbiological efficacy

Microbiological efficacy Microbiological properties were subjected to testing in accordance with ISO 22196 *Measurement of antibacterial activity on plastics and other non-porous surfaces,* against the following microorganisms:

- Escherichia coli ATCC 8739
- Staphylococcus aureus ATCC 6538

The reduction efficacy of more than 90% has been confirmed.

Storage

The granules have been developed in a manner that ensures the highest stability during storage and use.

Be aware that silver-containing materials may be sensitive to light and electromagnetic fields. Insufficiently mixed product may cause discolouration in the finished goods, which is why it is the responsibility of the manufacturer of the final component to fully assess it under normal conditions of use.

Before use

It is important, as with all chemicals, to read the product data sheet before use.

Before applying the product, always ensure that you have the latest information. For more information, contact us at kontakt@smartnanotech.com.pl.

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POLYDEF Ag+ 3D PLA

POLYMER MATRIX DATA SHEET

POLYDEF Ag+ 3D PLA is a polymer granulate with silver (Ag) particles designed for 3D printing (FDM/FFF) and imparts bactericidal and fungicidal properties to the finished prints.
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PHYSICAL PROPERTIES			
Parameter	**Standard**	**Value**	**Unit**
Density / Specific Gravity	ASTM D 792	1.18	g/cm^3
Melt Mass-Flow Rate (MFR) (210°C/2.16 kg)	ASTM D1238	7.0 – 9.0	g/10 min
Relative Viscocity (30°C)	ASTM D5225	4.0	-
MECHANICAL PROPERTIES			
Parameter	**Standard**	**Value**	**Unit**
Tensile Modulus	ASTM D638	2320	MPa
Tensile Strength	ASTM D638	50	MPa
Tensile Strength (Yield)	ASTM D638	51	MPa
Tensile Elongation (Break)	ASTM D638	3.3	%
Notched Izod Impact	ASTM D256	120	J/m
MECHANICAL PROPERTIES			
Parameter	**Standard**	**Value**	**Unit**
Deflection Temperature Under Load 0,45 Mpa, Unannealed	ASTM E2092	80.0 - 90.0	°C
Glass Transition Temperature	ASTM D3418	55.0 - 60.0	°C
Peak Crystalization Temperature (DSC)	ASTM D3418	165 - 180	°C

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REPORT

Evaluation of the biocidal properties of PLA-based composites

Materials and methods:

The experiment was performed according to ISO 22196: Plastic - Measurement of antibacterial activity on plastics and other non-porous surfaces.

Test microorganisms:

- *Escherichia coli* (ATCC 8739)
- *Staphylococcus aureus* (ATCC 6538)

Number of viable bacteria in the inoculum:

- *Escherichia coli* –7.5×10^5 cfu·cm^{-3}
- *Staphylococcus aureus* – 7.5×10^5 cfu·cm^{-3}

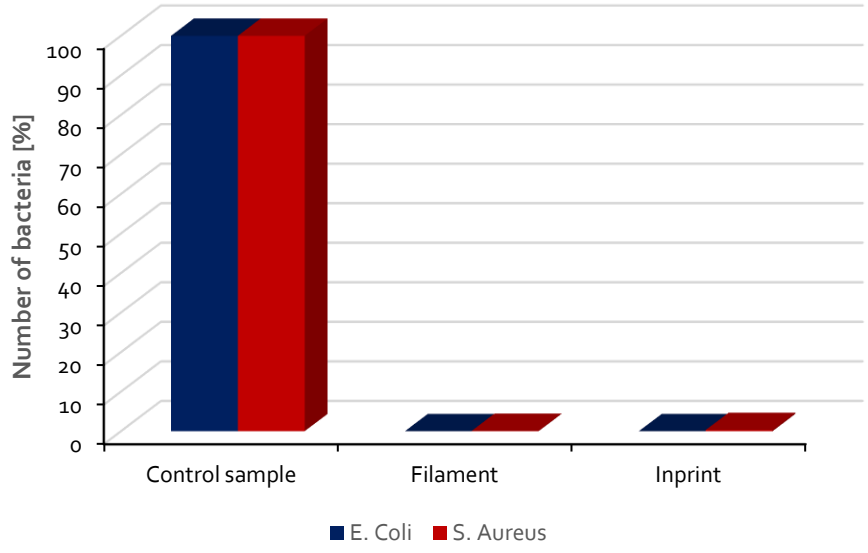
Contact time:

24 hour

Table 2 Antimicrobial activity and reduction of bacteria on tested surfaces.

Dosage	*E. coli*		*S. aureus*	
	Antimicrobial activity [log]	Reduction in number of bacteria [%]	Antimicrobial activity [log]	Reduction in number of bacteria [%]
Filament	4.1	100,0	1.9	99,9
Inprint	4.1	100,0	3,0	100,0

Graph 1. Antimicrobial activity and reduction of bacteria on tested surfaces.



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MODERN TECHNOLOGY

SAFE FOR HEALTH

DURABILITY OF USE

MANY POSSIBLE APPLICATIONS

smart NANOTECHNOLOGIES

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