MATERIAL INNOVATION × ADDITIVE MANUFACTURING

PCT Application Filed | SLS Process | Industry–Academia–Gov. / Go-Tech

FES Inc.

Flammable wood cellulose, creates Flame Resistance

Flame-retardant, low-impact 3D printing powder / art fabrication panels

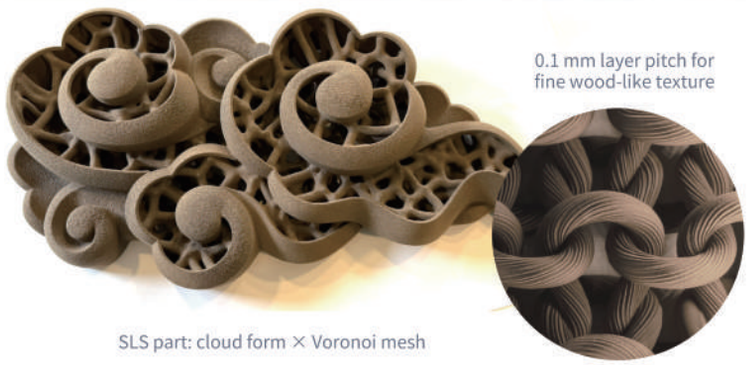
Pre-carbonized cellulose reaches UL94 V-0 with less flame retardant; voids become strength, lightness and circularity.

UL94 V-0	10–15%	Up to 80 wt%	27.7–28.0 MPa
Flame rating	Flame retardant / vs. conventional 789	Biomass content (PA11 grade)	Flexural strength after impregnation

Technology Overview

Wood look × fire resistance × no molds, in one material.

Interior and spatial design has long struggled to combine wood texture, complex 3D forms, flame resistance, short lead times, and mold-free production. This technology prints highly cellulose-filled powder directly by SLS, yielding parts that form a self-insulating char layer when burned. Roughly 60% porosity does double duty—enabling flame resistance and holding resin—so lightweight, recyclable grades or high-strength grades can be tailored to each use. Compounding, milling, printing, and vacuum impregnation are all done in-house.



SLS part: cloud form × Voronoi mesh

Core Technology

① Pre-carbonization formulation design

Compounding at 190 °C, where cellulose begins to carbonize, seeds char-forming nuclei inside the material. During combustion, synergy with the porous structure builds a thick 0.8–1.8 mm char layer—about 10× that of injection-molded parts. UL94 V-0 is achieved reliably with only 10–15% flame retardant (one-third of conventional), with a flame-out time of about 0.5–1 s.

② Dual use of porosity

Porosity is used two ways: as space for the char layer to grow, and as space to hold resin. Vacuum-impregnating ultra-low-viscosity epoxy raises flexural strength to 27.7–28.0 MPa (about 8–9.3× the unimpregnated value). UL94 V-0 is retained after impregnation, and the PA11 grade keeps a biomass content of about 60%.

How cellulose and porosity deliver flame resistance and high strength

1 Pre-carbonization



Compounded at 190 °C

Seeds char-forming nuclei inside the cellulose

2 Porous structure



Approx. 60% porosity

Space designed to grow char and hold resin

3 Self-insulating char layer



UL94 V-0

Stable with only 10–15% flame retardant (1/3 of conventional)

Dual use of porosity

- **Left empty** — Lightweight · easy to install · recyclable
- **Filled with resin** — Flexural strength 27.7–28.0 MPa

Key Specifications

Material systems PP (P2) / PA11 (A2) / PLA (L2)	**Flame rating** UL94 V-0 / Oxygen index (LOI) 24.2	**Powder properties** Avg. particle size 70 µm / max. 200 µm
Layer thickness 150 µm	**Build size** Max. 400 × 400 × 500 mm	**Biomass** Up to 80 wt% (PA11 grade)
Preheating control PLA: ≤60 °C (Tg = 62.7–67.9 °C)	**Post-processing** Large vacuum impregnation unit + ultra-low-viscosity epoxy	**Flexural strength (impregnated)** 27.7–28.0 MPa (approx. 8–9.3× before impregnation)

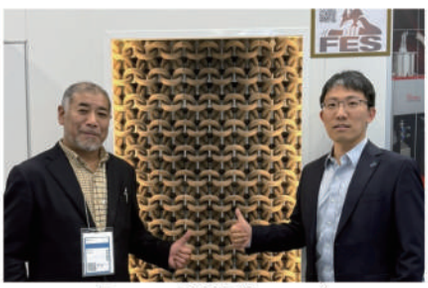
TATALAB TECHNOLOGY × PROOF × PRODUCTS

FES Inc.

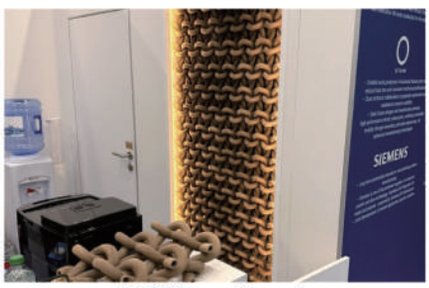
Proven at full scale and at international exhibitions
Material technology ready to deploy

Fabrication proof / Product lineup / Contract services & contact

Fabrication Track Record & Outreach



Formnext 2025 (Germany)
Booth design for an SLS machine maker



Exhibition wall panels
Units linked into large surfaces



Our booth during the show
Shown to European buyers and researchers

EUROPE	PACMA	M-Tech Expo	RECYCLING
European Innovation Center Exhibit planned	Sept. 9–11, 2026 Kyoto Institute of Technology	Oct. 7–9, 2026 INTEX Osaka	Toward operation at ≥95% reuse efficiency

Development Background & Our Strengths

01 | Explained by science
SEM observation and combustion analysis with Doshisha University and the Kyoto Municipal Institute of Industrial Technology and Culture.

02 | Weakness into strength
Flammable cellulose becomes a flame-retardant aid; voids are re-read as resin-holding space.

03 | In-house integration + field expertise
Compounding, milling, printing and vacuum impregnation all in-house. Large-scale art fabrication know-how feeds back into the material.

Product Lineup

A | Flame-retardant wood powder for SLS
TATALAB Powder

For | SLS printer owners & 3D printing service bureaus

Flame-resistant, high-biomass SLS powder in three grades



- PP grade (P2): 40% cellulose. UL94 V-0, cost-focused
- PA11 (A2) / PLA (L2): UL94 V-0. Castor-oil / starch derived; PA11 up to 80 wt%
- All grades: avg. particle size 70 µm (max. 200 µm) / layer thickness 150 µm
- Compounding to milling managed in-house. Print-tested on other makers' SLS machines

B | Flame-retardant panel products
TATALAB Panels

For | Interior & event design firms: retail, hotels, exhibitions

Complex wood-look designs for walls, ceilings & monuments, mold-free



[Eco-focused] Meguri | LOOP:
Voids left empty. Lightweight; easy to install/remove; re-millable
[Strength-focused] Tokiwa | TOKIWA:
Resin-impregnated. Flexural strength 27.7–28.0 MPa

- Both grades UL94 V-0; PA11 keeps ~60% biomass even after impregnation
- Less mold scrap; one-piece mesh, crossing and hollow forms molds can't make
- Parts up to 400 × 400 × 500 mm on large SLS; units join into large surfaces

Contract work Vacuum impregnation of parts you printed yourself, plus high-strength TOKIWA-grade specs on request.

TATALAB From "tatara" (traditional smelting) + LAB: powder technology that creates value from fire and powder. SLS is the modern tatara.

Contact us for powder supply, print trials, design panel fabrication, or vacuum impregnation only

Contact

FES Inc. | Contact: Mazuka Kimura (Representative Director)
1-388 Kitashirakawa Minamigahara-cho, Sakyo-ku, Kyoto 606-8453, Japan
TEL +81-75-585-4355 | E-mail kimura@fes.kyoto.jp
Web https://fes.kyoto.jp/

Company website