

# MultiMat<sup>3</sup> - Development of Materials and Material Combinations for Arburg Plastic Freeforming (APF) and Fused Filament Fabrication (FFF)

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### Material Development

- Layered Double Hydroxides (LDH) to form nanocomposites
- In situ modification of LDH

[Xplore]

Wagner & Reisinger power law  
 $\eta = A\omega^n$   
 Shear thinning exponent (STE)  
 Degree of exfoliation and delamination

### Two Process Chains to Get Printed Products

**Arburg Plastic Freeforming (APF)**  
 Discharge and deposition of individual droplets | layer by layer

**Fused Filament Fabrication (FFF)**  
 Filament Extrusion | layer by layer deposition

### Part Analysis

#### Mechanical

Print direction

Development Z-Type Tensile Rod

- No support
- Many materials
- Development continuing...

Process changes – DoE

#### Multi-Material

2K Tensile Flat

- Any material combination
- Interlocking through form fitting

2K Z-Type

- Hard-Hard
- Layer adhesion

Peel Test

- Hard-Soft
- Layer adhesion

#### Morphology

Macro (CT-scan)

Micro (microscope)

Discharge

### Results

#### Comparison of mechanical properties

Selection of tensile test results

#### Peel Test

#### Influence of printing parameters on voids (DoE)