N3XTDIMENSION®

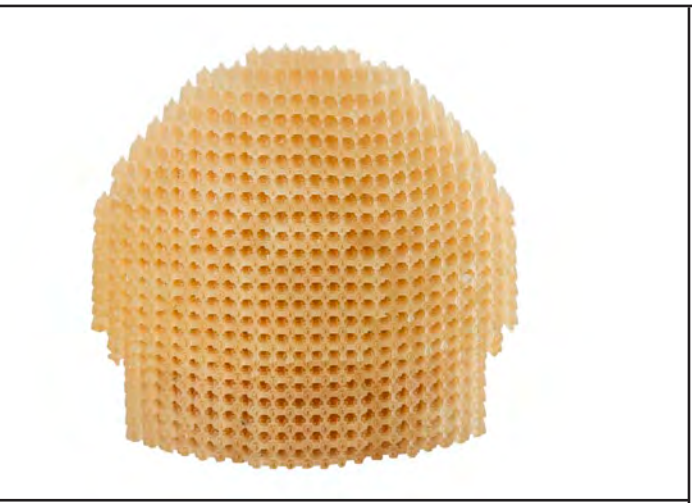
TECHNICAL DATA SHEET

# N3D-DIELEC731

## Ultra-low dielectric loss material

SLA DLP LCD

N3D-DIELEC731 is an unfilled dielectric material with ultra-low loss, suitable for radiofrequency (RF) devices. N3D-DIELEC731 can be used in the manufacturing of antenna & connector elements, Luneburg lenses, waveguides, and dielectric reflectarrays.



## KEY FEATURES

- Ultra-low dielectric loss
- Low moisture uptake
- High breakdown strength
- Stable dielectric constant across broad frequency range

## APPLICATIONS

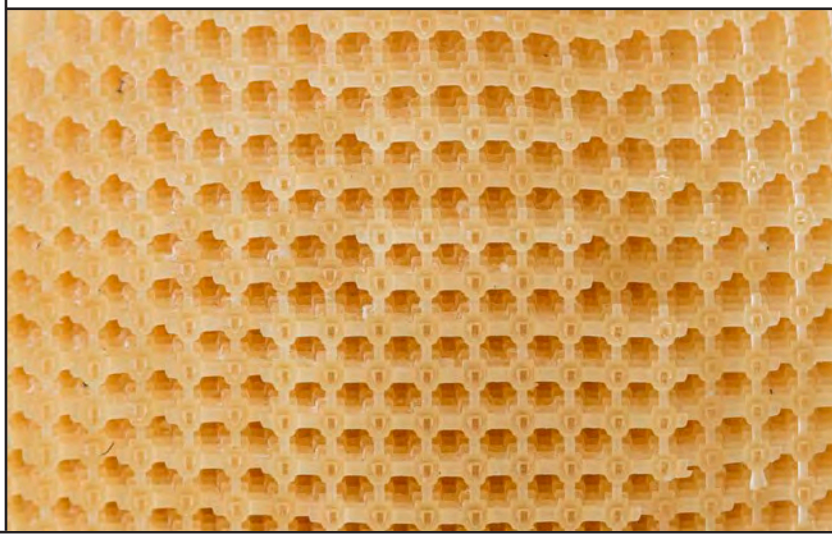
- High frequency RF devices
- Antenna & connector elements
- Luneburg lenses
- Waveguides
- Dielectric reflectarrays

## MAIN MARKETS

- Electronics
- Automotive
- Industrial
- Transportation

## KEY PROPERTIES

| N3D-DIELEC731 | |
|---|---|
| Liquid | |
| Appearance | Yellow |
| Viscosity @ 25°C | 1960 |
| Material | |
| Dielectric Constant, 1 kHz | 2.98 |
| Dielectric Constant, 10 kHz | 2.59 |
| Dissipation Factor, 10 GHz | 0.0030 |
| Breakdown Strength, V/µm | 800 |
| Volume Resistivity, Ω*cm | 6.8269E+16 |
| Surface Resistivity, Ω/sq | 2.72018E+16 |
| CTE 20°C (Above $T_g$/Below $T_g$) | 76.73/135.3 |
| $T_\alpha$ Onset (°C), TGA | 216°C |



ARKEMA

# N3D-DIELEC731

Ultra-low dielectric loss material

TECHNICAL DATA SHEET

## MATERIAL PROPERTIES

| Property | Units | Method | Final Properties |
|---|---|---|---|
| Tensile Strength | MPa | ASTM D638 | 38 ± 2 |
| Tensile Modulus | MPa | ASTM D638 | 2340 ± 10 |
| Tensile Elongation at Break | % | ASTM D638 | 5 ± 1 |
| Flexural Strength | MPa | ASTM D790 | 73 ± 11 |
| Flexural Modulus | MPa | ASTM D790 | 2020 ± 90 |
| HDT @ 0.455 MPa | °C | ASTM D648 | 102 |
| HDT @ 1.8 MPa | °C | ASTM D648 | 67 |
| $T_g$, by DMA | °C | ASTM D4065 | 77 |
| Water Absorption | % weight gain, 24 hours | ASTM D570 | 0.38 |
| Dielectric Constant | 1 kHz/23°C | ASTM D150 | 2.98 |
| Dielectric Constant | 10 GHz/23°C | IPC-TM-650 2.5.5.13 Split-cylinder resonant cavity | 2.59 |
| Dissipation Factor | 10 GHz | | 0.0030 |
| Breakdown Strength | V/µm, 23°C | ASTM D149 | 800 |
| Volume Resistivity | Ω*cm, 23°C | ASTM D257 | 6.8269E+16 |
| Surface Resistivity | Ω/ sq., 23°C | ASTM D257 | 2.72018E+16 |
| CTE 20°C (Above $T_g$/Below $T_g$) | µm/m*C | IPC-TM-650 2.4.24.3 | 76.73/135.3 |
| $T_d$ Onset (°C), TGA | °C | ASTM D3850 | 216 |

# N3D-DIELEC731

Ultra-low dielectric loss material

TECHNICAL DATA SHEET

## LIQUID PROPERTIES

| Property | Units | Method | Value |
|---|---|---|---|
| Appearance | — | — | Yellow |
| Viscosity, 25°C | cP | Brookfield SP #31 | 1960 |
| Liquid Density | g/cm$^3$ | Gardco cup | 1.086 |

## PRINTING CONDITIONS

Reactivity values were generated on a 385 nm wavelength bottom-up 3D printer with an irradiance of 4.5 mW/cm$^2$.

| Working-Curves | Units | Value |
|---|---|---|
| Critical Exposure ($E_c$) | mJ/cm$^2$ | 3.4 |
| Penetration Depth ($D_p$) | mils | 3.5 |

3D printing parameters that can be used as starting points on LCD and DLP 3D printers are shown in the table below. Although not explicitly stated, other 3D printing parameters may be realized through process development.

| 3D Printing Parameter | Units | Printing & Reactivity | |
|---|---|---|---|
| Layer Thickness | µm | 50 | 50 |
| Wavelength | nm | 385 | 385 |
| Intensity | mW/cm$^2$ | 5 | 12 |
| Standard Exposure Time | Sec | 4 | 2 |
| Burn in Exposure Time | Sec | 16 | 10 |

For additional guidance on print parameter setup for specific 3D printers, consult with Arkema technical service teams.

## CLEANING PROCESS

Submerge 3D printed parts in ethyl lactate and agitate and/or sonicate for approximately 10 minutes. Incorporate two-stage cleaning baths for optimal cleaning. Use compressed air to remove any residual liquid material. Repeat steps as necessary until parts are free of residual material, and then proceed to post-curing.

## STORAGE & HANDLING

Store bottles in a cool, dry place. The material is light sensitive. Keep open bottles away from ambient lighting or sunlight, and shield material from ambient light. Once opened, packaging should be resealed immediately after use. See Safety Data Sheet for additional storage & handling considerations.



**Arkema Inc.**
502 Thomas Jones Way
Exton, PA 19341
America

**Arkema France**
420, rue d'Estienne d'Orves
92705 Colombes Cedex
France