

DuPont™ Nomex® 411 Paper, 7 mil Nominal Thickness

Category : Other Engineering Material , Composite Fibers , Polymer , Film , Thermoset , Aramid

Material Notes:

Nomex® Type 411 is the uncalendared precursor of Type 410. It has a lower density and lower property values. It is used in applications such as motor phase insulation and transformer coil end filler, where high bulk and conformability are of prime importance. Nomex® Type 411 offers increased impregnability and saturability compared to Type 410, making Type 411 suitable for use in cast resin applications such as turn and layer insulation. General NOMEX Information: Nomex® is a family of aromatic polyamide (aramid) fibers. This family consists of staple fibers, continuous filament yarns, paper, and spunlaced fabrics. The paper is produced from two forms of the aramid polymer. Small fibrous binder particles (fibrils) derived directly from the polymer under high shear conditions are mixed with short fibers (floc) which are cut to length from a fiber filament. The floc and fibrils are combined in a water based slurry from which a continuous sheet is produced on a specialized papermaking machine. This initial paper (as in Type 411) is low density and has poor properties. Subsequent densification and internal bonding is achieved by high temperature calendaring. The resulting paper is mechanically strong and has good electrical properties. Some uses for paper product include insulation in electric motors and transformers, wire wrapping, and honeycombed strength members in many aircraft. Nomex® brand fibers are inherently flame resistant: the flame resistance is a polymer property and does not diminish with the life of the fiber. Nomex® meta-aramid, poly(meta-phenyleneisophthalamide), is prepared from meta-phenylenediamine and isophthaloyl chloride in an amide solvent. It is a long chain polyamide in which at least 85% of the amide linkages are attached directly to two aromatic rings. The meta oriented phenylene forms bends in the polymer chain, reducing chain rigidity as compared to the para orientation in the chemically similar Kevlar® chain. This flexible polymer chain gives Nomex® more textile-like qualities while retaining high temperature properties similar to Kevlar®. Information provided by DuPont.

Order this product through the following link:

http://www.lookpolymers.com/polymer_DuPont-Nomex-411-Paper-7-mil-Nominal-Thickness.php

| Physical Properties | Metric | English | Comments |
|---------------------|-------------|---------------------------|--------------------|
| Bulk Density | 0.310 g/cc | 0.0112 lb/in ³ | |
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| Thickness | 178 microns | 7.00 mil | Nominal |
| | 206 microns | 8.10 mil | Typical; TAPPI-411 |

| Mechanical Properties | Metric | English | Comments |
|------------------------------|----------------|-------------|---|
| Film Elongation at Break, MD | 3.8 % | 3.8 % | ASTM D828 |
| Film Elongation at Break, TD | 5.6 % | 5.6 % | ASTM D828 |
| Tear Strength, Total | 5.00 N | 1.12 lb (f) | Initial in TD; ASTM D1004 |
| | 10.0 N | 2.25 lb (f) | Initial in MD; ASTM D1004 |
| Elmendorf Tear Strength, MD | 0.787 g/micron | 20.0 g/mil | Calculated from mfr's report of 1.6 N per TAPPI-414 and the typical thickness |

| Mechanical Properties | Metric | English | Comments |
|------------------------------------|----------|----------|---|
| Film Tensile Strength, MD | 13.1 MPa | 1900 psi | Calculated from mfr's report of 27 N/cm per ASTM D828 and the typical thickness |
| Film Tensile Strength at Break, MD | 13.1 MPa | 1900 psi | Calculated from mfr's report of 27 N/cm per ASTM D828 and the typical thickness |
| Film Tensile Strength at Break, TD | 6.80 MPa | 986 psi | Calculated from mfr's report of 14 N/cm per ASTM D828 and the typical thickness |

| Thermal Properties | Metric | English | Comments |
|----------------------------------|--------|---------|-----------------------|
| Maximum Service Temperature, Air | 220 °C | 428 °F | Electrical insulation |
| Shrinkage, MD | 0.60 % | 0.60 % | at 240°C |
| Shrinkage, TD | 0.70 % | 0.70 % | at 240°C |

| Electrical Properties | Metric | English | Comments |
|-----------------------|--------------------|--------------------|-------------------------------|
| Dielectric Constant | 1.2 | 1.2 | ASTM D150 |
| | @Frequency 60 Hz | @Frequency 60 Hz | |
| | 1.3 | 1.3 | ASTM D150 |
| | @Frequency 1000 Hz | @Frequency 1000 Hz | |
| Dielectric Strength | 9.00 kV/mm | 229 kV/in | AC Rapid Rise; ASTM D149 |
| | 18.0 kV/mm | 457 kV/in | Full-wave Impulse; ASTM D3426 |
| Dissipation Factor | 0.0030 | 0.0030 | ASTM D150 |
| | @Frequency 60 Hz | @Frequency 60 Hz | |
| | 0.0050 | 0.0050 | ASTM D150 |
| | @Frequency 1000 Hz | @Frequency 1000 Hz | |

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