

## Chemical Exposure Effects

### Metal Compatibility

Issues of metal compatibility depend on several factors – temperature, atmosphere (oxidizing, reducing, neutral, and vacuum) and what other materials (fluxes, etc.) may be present. Therefore, we recommend that sample fabrics be tested under the actual use conditions before proceeding with any component fabrication.

In general, under oxidizing conditions any metals that form low melting oxides will degrade the performance of 3M™ Nextel™ Fabrics. These include alkali metals such as sodium, potassium and lithium. Also included are low melting glass formers such as lead, phosphorous, tin and antimony. The transition metals of titanium, vanadium, manganese, nickel and copper degrade 3M Nextel Fibers under oxidizing high temperature conditions.

At temperatures above 2192°F (1200°C) in a hydrogen containing atmosphere with a very low dew point, the SiO<sub>2</sub> component in our

fibers can be reduced to SiO gas and degrade the fabric.

3M Nextel 440 Fibers are compatible with platinum metals at high temperatures and are used for flexible high temperature thermocouples.

### Chemical Resistance

Short-term chemical exposure tests were performed on heat cleaned 3M Nextel Woven Tapes 312 and 440 and heat treated 3M Nextel Woven Tape 312 1 inch (2,54 cm) wide. Table 1 lists the strength retention results after chemical exposure and Table 2 lists the strength retention after rinsing the chemically exposed tapes with de-ionized water.

All samples were run on a tensile tester with cross-head speed of 0.5 inch/min (1,27 cm/min) using a 3 inch (7,61 cm) gauge length. All samples were loaded to failure (break).

**Table 1. Percent Strength Retention After Exposure**

Chemical	Concentration	3M™ Nextel™ Tape 312		3M™ Nextel™ Tape 440
		Heat Cleaned	Heat Treated	Heat Cleaned
<b>Acids</b>				
HNO <sub>3</sub> Nitric Acid	10%	50%	95%	88%
HCl Hydrochloric Acid	10%	85%	98%	98%
H <sub>2</sub> SO <sub>4</sub> Sulfuric Acid	10%	38%	65%	72%
H <sub>3</sub> PO <sub>4</sub> Phosphoric Acid	10%	<1%	<1%	<1%
<b>Bases</b>				
KOH Potassium Hydroxide	10%	<1%	<1%	<1%
NaOH Sodium Hydroxide	10%	<1%	<1%	<1%
NH <sub>4</sub> OH Ammonium Hydroxide	10%	78%	77%	96%
CaO Calcium Oxide	Saturated	48%	99%	94%

Test Method:

1. Soak individual samples for one hour in a 10% (by weight) chemical bath.
2. Dry samples at room temperature for at least 20 hours.
3. Heat samples at 1472°F (800°C) for 15 minutes.
4. Return to room temperature, load samples to failure.
5. Determine strength retention (average of five samples).

**Table 2. Percent Strength Retention After Rinsing in H<sub>2</sub>O**

Chemical	Concentration	3M™ Nextel™ Tape 312		3M™ Nextel™ Tape 440
		Heat Cleaned	Heat Treated	Heat Cleaned
<b>Acids</b>				
H <sub>3</sub> PO <sub>4</sub> Phosphoric Acid	10%	82%	106%	100%
<b>Bases</b>				
KOH Potassium Hydroxide	10%	77%	86%	98%
NaOH Sodium Hydroxide	10%	61%	78%	84%

Test Method:

1. Soak samples for one hour in a 10% (by weight) chemical bath.
2. Dry samples at room temperature for at least 20 hours.
3. Soak samples in 150 ml of deionized water for 15 minutes.
4. Rinse sample in tap water.
5. Dry samples at 193°F (75°C) for 15 minutes.
6. Heat samples at 1472°F (800°C) for 15 minutes.
7. Return to room temperature, load samples to failure.
8. Determine strength retention (average of five samples).