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Chemical Compatibility of Radel® PPSU Used in Aircraft Cabin Interiors

Radel® polyphenylsulfone (PPSU) is a versatile, super-tough plastic manufactured by Solvay Specialty Polymers. Products in the Radel® R-7000 series are designed specifically for use in structural and decorative aircraft cabin interior components. They have excellent chemical resistance and are compliant with all commercial and regulatory requirements for flammability, smoke density, heat release and toxic emissions.

This document summarizes the results of chemical resistance testing of Radel® R-7000 products and other commercially available aircraft interior plastics listed below. Test samples were exposed to a variety of pesticides, detergents and solvents commonly used to service aircraft cabin interiors and then evaluated for their compatibility with these chemicals.

Materials tested

- Radel® R-7700 PPSU
- Radel® R-7300 PPSU
- Radel® R-7159 PPSU
- Ultem® 9075 polyetherimide (PEI)
- Ultem® 9085 polyetherimide (PEI)
- Lexan® FST-9075 polycarbonate (PC)

ESCR Testing Method

Environmental Stress Crack Resistance (ESCR) testing is used to quantify the sensitivity of a plastic to chemical attack when the material is stressed. Residual stress created inside a component during manufacturing or high stress incurred during service is simulated in ESCR testing by using a variable radius strain fixture (see Figure 1).

Figure 1: Variable radius fixture



The fixture is marked with numbers that correlate the position on the fixture to the radius of curvature at that point. Using the position in the fixture and the specimen thickness, the strain at any point can be calculated. From the strain and the tensile modulus of the material, the corresponding stress can be computed.

The molded test specimens measured 130 x 13 x 4 mm. The maximum applied strain ranged from 1.05 to 1.2 %. Materials were exposed to a variety of pesticides and detergents at 23 °C (73 °F), 50 °C (122 °F) and 95 °C (203 °F) since increasing temperature is known to accelerate environmental stress crazing. Materials were also exposed to a variety of solvents at 23 °C (73 °F).

Prior to testing, test specimens were annealed for 2 hours at each material's glass transition temperature (T_g) minus 20 °C (68 °F). Then, the test specimen was clamped to the variable radius strain fixture and conditioned to the specified temperature. The assembly was sprayed with the test solution for one minute and returned to the test temperature. This procedure was repeated twice at one-hour intervals. The stressed test specimen was maintained at test temperature for a total elapsed exposure time of 24 hours.

Specimens were visually examined for evidence of crazing using strong illumination and magnification at each of the radius positions. If crazing was seen below the 1.2 % maximum applied strain, the strain level at which it was first noted is the critical strain for that combination of material and environmental conditions. If no crazing was observed, then the critical strain is judged to be greater

than the maximum applied strain, which implies that negligible stress cracking will occur with that test fluid under the specific conditions tested.

Test results are summarized in Tables 1 through 3. For the various test conditions, a check mark indicates that the material passed and a blank space indicates that the material failed.

Table 1: Resistance to detergents⁽¹⁾

Products ⁽²⁾	Temp	Radel® PPSU R-7700	Radel® PPSU R-7300	Radel® PPSU R-7159	Ultem® PEI 9075	Ultem® PEI 9085	Lexan® PC FST-9705
Suma® Super L1	23 °C	✓	✓	✓	✓	✓	
	95 °C	✓	✓	✓			
Suma® Ultra L1	23 °C	✓	✓	✓	✓	✓	
	95 °C	✓	✓	✓			
Suma® Alu free L1	23 °C	✓	✓	✓	✓	✓	✓
	95 °C	✓	✓	✓			

⁽¹⁾ Duration: 24 hours; applied strain: 1.2 %

⁽²⁾ Diversey-Lever Products

Table 2: Resistance to pesticides⁽¹⁾

Products ⁽²⁾	Temp	Radel® PPSU R-7700	Radel® PPSU R-7300	Radel® PPSU R-7159	Ultem® PEI 9075	Ultem® PEI 9085	Lexan® PC FST-9705
1-shot aerosol	23 °C	✓	✓	✓	✓	✓	✓
	50 °C	✓				✓	
Aerosafe	23 °C	✓	✓	✓	✓	✓	✓
	50 °C						
Fresh & Clean, lemon	23 °C	✓	✓	✓	✓	✓	
	50 °C						
Prespray	23 °C	✓	✓	✓	✓	✓	✓
	50 °C	✓	✓		✓		
Top of Descent	23 °C	✓	✓	✓	✓	✓	✓
	50 °C	✓	✓	✓			

⁽¹⁾ Duration: 24 hours; applied strain: 1.2 %

⁽²⁾ Callington Haven Products

Table 3: Resistance to solvents⁽¹⁾

Products	Temp	Radel® PPSU R-7700	Radel® PPSU R-7300	Ultem® PEI 9075	Ultem® PEI 9085	Lexan® PC FST-9705
Toluene (100 %)	23 °C		✓	✓		
MEK (100 %)	23 °C					
MEK/IPA (75 % / 25 %)	23 °C	✓	✓	✓		
Toluene IPA (50 % / 50 %)	23 °C	✓	✓	✓		
1,1,1 Trichlorethane	23 °C	✓	✓			

⁽¹⁾ Duration: 24 hours; applied strain: 1.05 %



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