

Chemical Compatibility of KetaSpire PEEK and AvaSpire Modified PEEK

KetaSpire PEEK and AvaSpire modified PEEK have excellent chemical resistance and are compatible with many common reagents and industry-specific fluids. The chemical compatibility was evaluated in both stressed and unstressed conditions.

To evaluate the unstressed compatibility, tensile bars (ASTM D 638 Type 1) were weighed and then immersed in the fluids for 30 days at room temperature. After 30 days, the bars were removed from the environment, rinsed, wiped off, and reweighed. The tensile strength and elongation was then measured and compared to the unexposed value. Any change in appearance was also noted.

In the unstressed condition, KetaSpire PEEK has excellent resistance to most chemicals. However, KetaSpire PEEK is affected by concentrated strong acids. AvaSpire modified PEEK maintains the excellent chemical resistance of PEEK in most environments, but it is affected by chlorinated hydrocarbons. In general, AvaSpire AV651 will have superior chemical resistance to AvaSpire AV650.

Compatibility is rated as follows:

- A Excellent; Little or no effect
- B Good; No serious loss of properties
- C Fair; Some negative effects, some useful properties retained
- F Poor; Severe attack or rupture

Table 1

Unstressed Compatibility with Aqueous Acids and Bases

Environment	Weight Change, %	Retention of Yield Tensile Strength, %	Retention of Modulus, %	Rating
Hydrochloric acid, 37%				
KT-820 NT	0.26	99	101	A
AV-651 BG15 ⁽¹⁾	0.60	99	103	A
Nitric Acid, 10%				
KT-820 NT	0.27	99	99	A
AV-651 BG15 ⁽¹⁾	0.59	98	101	A
Nitric Acid, 30%				
KT-820 NT	0.25	100	100	A
AV-651 BG15 ⁽¹⁾	0.52	98	101	A
Sulfuric acid, 20%				
KT-820 NT	0.27	99	102	A
AV-651 BG15	0.55	98	103	A
AV-650 BG15	0.57	95	99	A
Sulfuric acid, 50%				
KT-820 NT	0.03	101	99	A
AV-651 BG15	0.24	95	97	A
AV-650 BG15	0.24	98	100	A
Potassium hydroxide, 45%				
KT-820 NT	0.03	101	101	A
AV-651 BG15	0.14	101	103	A

⁽¹⁾ Slight discoloration

The results of the unstressed testing shown in Tables 1 through 3 indicate that these materials have exceptional chemical resistance at room temperature to all the reagents tested, except for AvaSpire AV-651 modified PEEK in methylene chloride.

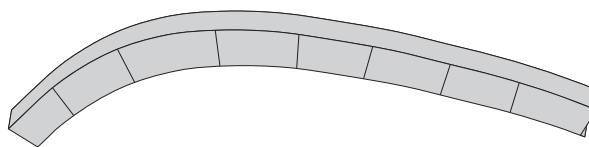
Testing Under Stress

To evaluate the effect of applied external stress upon the chemical resistance of these materials a variable radius strain fixture was used. Test specimens were clamped to the fixture and the assembly was immersed in the test solution for 24 hours. After 24 hours the specimens were examined for crazing and the lowest gradation on the fixture was noted. From this value and the specimen thickness the applied strain was calculated. From the strain and the elastic modulus, the resultant stress was calculated. The critical strain is defined as the lowest strain at which crazing is evidenced.

The results of this testing are shown in Table 4. In general, AvaSpire AV-651 BG15 is very similar to KetaSpire KT-820 NT in chemical compatibility.

Figure 1

Variable Radius Strain Fixture



For more information or to discuss these results please contact your Solvay sales representative or email us at advancedpolymers@solvay.com.

Table 2

Unstressed Compatibility with Organic Solvents

Environment	Weight Change, %	Retention of Yield Tensile Strength, %	Retention of Modulus, %	Rating
Acetone				
KT-820 NT	0.02	101	101	A
AV-651 BG15	0.21	93	104	A
Cyclohexane				
KT-820 NT	0.01	101	100	A
AV-651 BG15	0.04	101	103	A
Ethanol				
KT-820 NT	-0.02	99	101	A
AV-651 BG15	0.10	103	105	A
Ethyl acetate				
KT-820 NT	-0.03	100	100	A
AV-651 BG15	0.21	100	100	A
AV-650 BG15	0.08	99	162	A
Methylene Chloride				
KT-820 NT	1.37	94	100	A
AV-651 BG15 ⁽²⁾	34.14	52	1	F
Methyl ethyl ketone				
KT-820 NT	-0.04	101	99	A
AV-651 BG15 ⁽³⁾	0.20	101	103	A
Toluene				
KT-820 NT	0.01	99	98	A
AV-651 BG15	0.06	102	100	A
1,1,1-trichloroethane				
KT-820 NT	-0.01	101	98	A
AV-651 BG15	0.03	102	103	A

⁽²⁾ Swollen

⁽³⁾ Surface Dulled

Table 3

Unstressed Compatibility with Selected Industrial Fluids

Environment	Weight Change, %	Retention of Yield Tensile Strength, %	Retention of Elongation at break, %	Rating
Automatic Transmission Fluid (Dexron III Mercon)				
KT-820 NT	0.31	95	97	A
AV-651 BG15	0.01	105	103	A
AV-650 BG15	0.04	102	101	A
Brake Fluid (DOT 3)				
KT-820 NT	-0.11	95	97	A
AV-651 BG15	0.13	105	103	A
AV-650 BG15	-0.13	102	100	A
CaCl₂ Brine with SAFE-COR Corrosion Inhibitor (1%)				
KT-820 NT	0.00	95	97	A
AV-651 BG15	0.07	105	103	A
AV-650 BG15	0.07	102	102	A
Gasoline				
AV-651 BG15	0.11	104	105	A
AV-650 BG15	0.18	102	105	A
Jet Fuel A				
AV-651 BG15	0.08	104	102	A
AV-650 BG15	0.20	102	101	A
Motor Oil (10W-30)				
KT-820 NT	0.09	95	97	A
AV-651 BG15	0.17	105	101	A
AV-650 BG15	0.45	102	102	A

Table 4

Chemical Compatibility Under Stress

Reagent	KT-820 NT		AV-651 BG 15	
	Critical Strain, %	Critical Stress, psi (MPa)	Critical Strain, %	Critical Stress, psi (MPa)
Aqueous Acids and Bases				
Sulfuric acid, 20%	>2.0	10,600 (73)	>2.0	9,000 (62)
Sulfuric acid, 50%	>2.0	10,600 (73)	>2.0	9,000 (62)
Hydrochloric acid, 37%	>2.0	10,600 (73)	>2.0	9,000 (62)
Potassium hydroxide, 45%	>2.0	10,600 (73)	>2.0	9,000 (62)
Organic Solvents				
Acetone	1.03	5,500 (38)	1.03	4,600 (32)
Cyclohexane	>2.0	10,600 (73)	>2.0	9,000 (62)
Ethanol	>2.0	10,600 (73)	>2.0	9,000 (62)
Ethyl acetate	0.97	5,100 (35)	0.86	3,900 (27)
Methylene Chloride	>2.0	10,600 (73)	0.91*	4,100 (28)
Methyl ethyl ketone	1.03	5,500 (38)	0.91	4,100 (28)
Toluene	1.03	5,500 (38)	0.91	4,100 (28)
1,1,1-trichloroethane	>2.0	10,600 (73)	>2.0	9,000 (62)

*Surface etching and dissolution

Solvay Advanced Polymers, L.L.C.

4500 McGinnis Ferry Road

Alpharetta, Georgia 30005-3914 USA

Phone: +1.770.772.8200

+1.800.621.4557 (USA Only)

Fax: +1.770.772.8454

Solvay Advanced Polymers has offices in the Americas, Europe, and Asia. Please visit our website at

www.solvayadvancedpolymers.com to locate the office nearest you.

Health and Safety Information

Material Safety Data Sheets (MSDS) for our products are available upon request from your Solvay Advanced Polymers sales representative or by writing to the address shown above. Always consult the appropriate MSDS before using any of our products.

KetaSpire and AvaSpire are trademarks of Solvay Advanced Polymers, L.L.C.

To our actual knowledge, the information contained herein is accurate as of the date of this document. However, neither Solvay Advanced Polymers, L.L.C. nor any of its affiliates makes any warranty, express or implied, or accepts any liability in connection with this information or its use. This information is for use by technically skilled persons at their own discretion and risk and does not relate to the use of this product in combination with any other substance or any other process. This is not a license under any patent or other proprietary right. The user alone must finally determine suitability of any information or material for any contemplated use, the manner of use and whether any patents are infringed. This information gives typical properties only and is not to be used for specification purposes. Solvay Advanced Polymers, L.L.C. reserves the right to make additions, deletions, or modifications to the information at any time without prior notification.