

# **PENCHEM**® Adhesive for 5G Optical Communication Application

**Introduction of 5G**

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graph TD; A[Introduction of 5G] --> B[Devices for optical fiber communication]; B --> C[Types of optical devices]; C --> D[Requirements for 5G adhesives]; D --> E[Case Studies for 5G adhesives];
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**Devices for optical fiber communication**

**Types of optical devices**

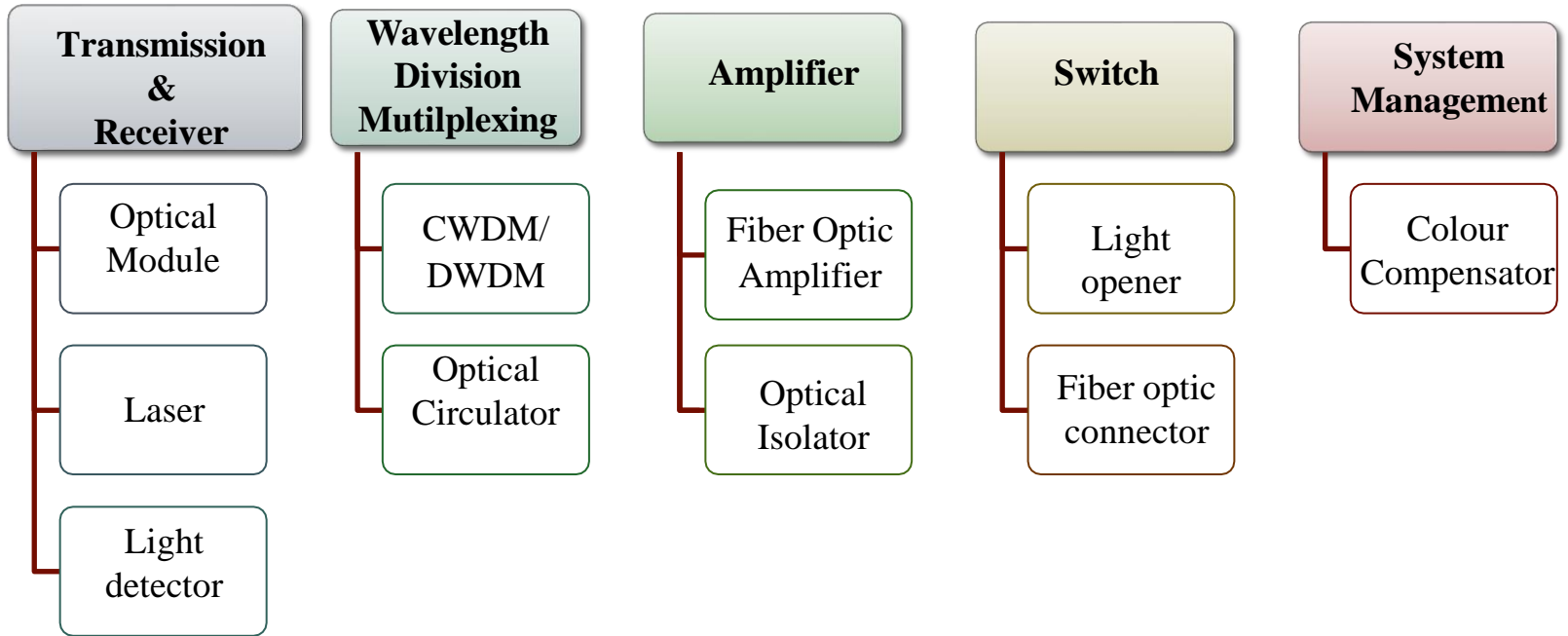
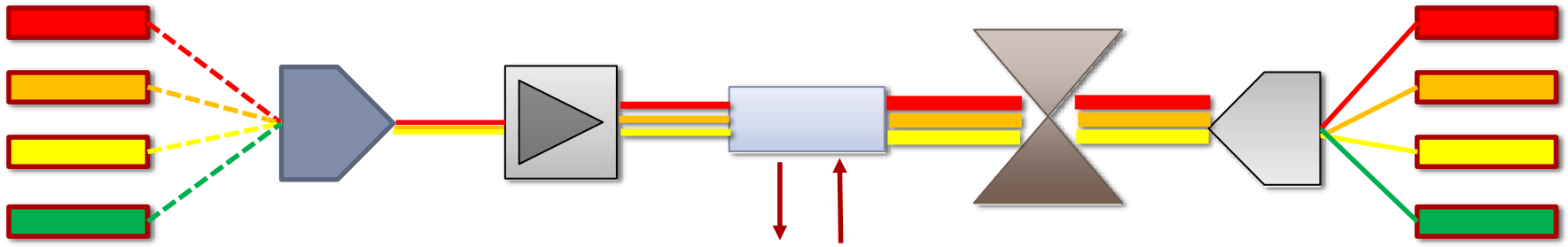
**Requirements for 5G adhesives**

**Case Studies for 5G adhesives**

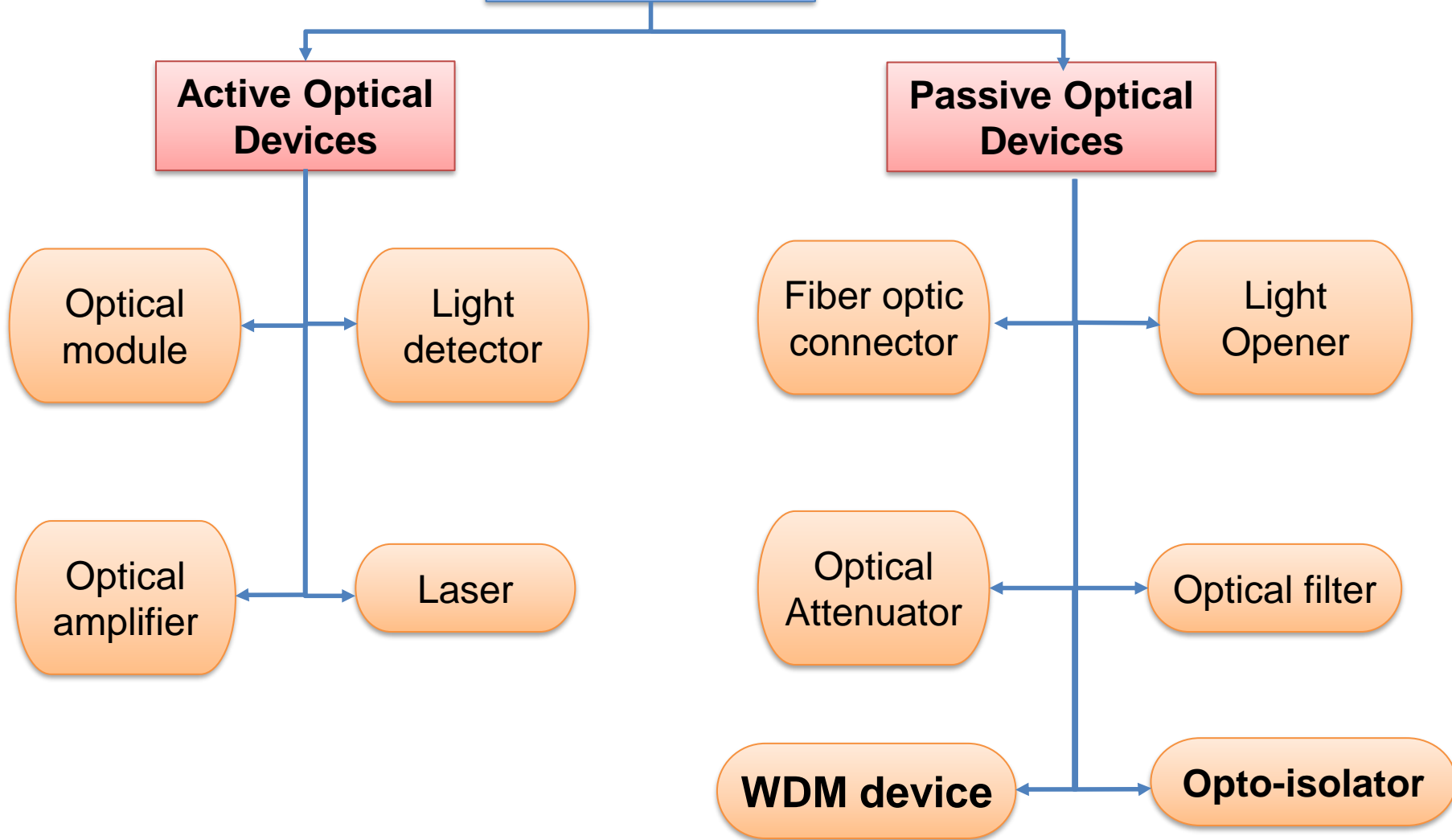
## What is 5G?

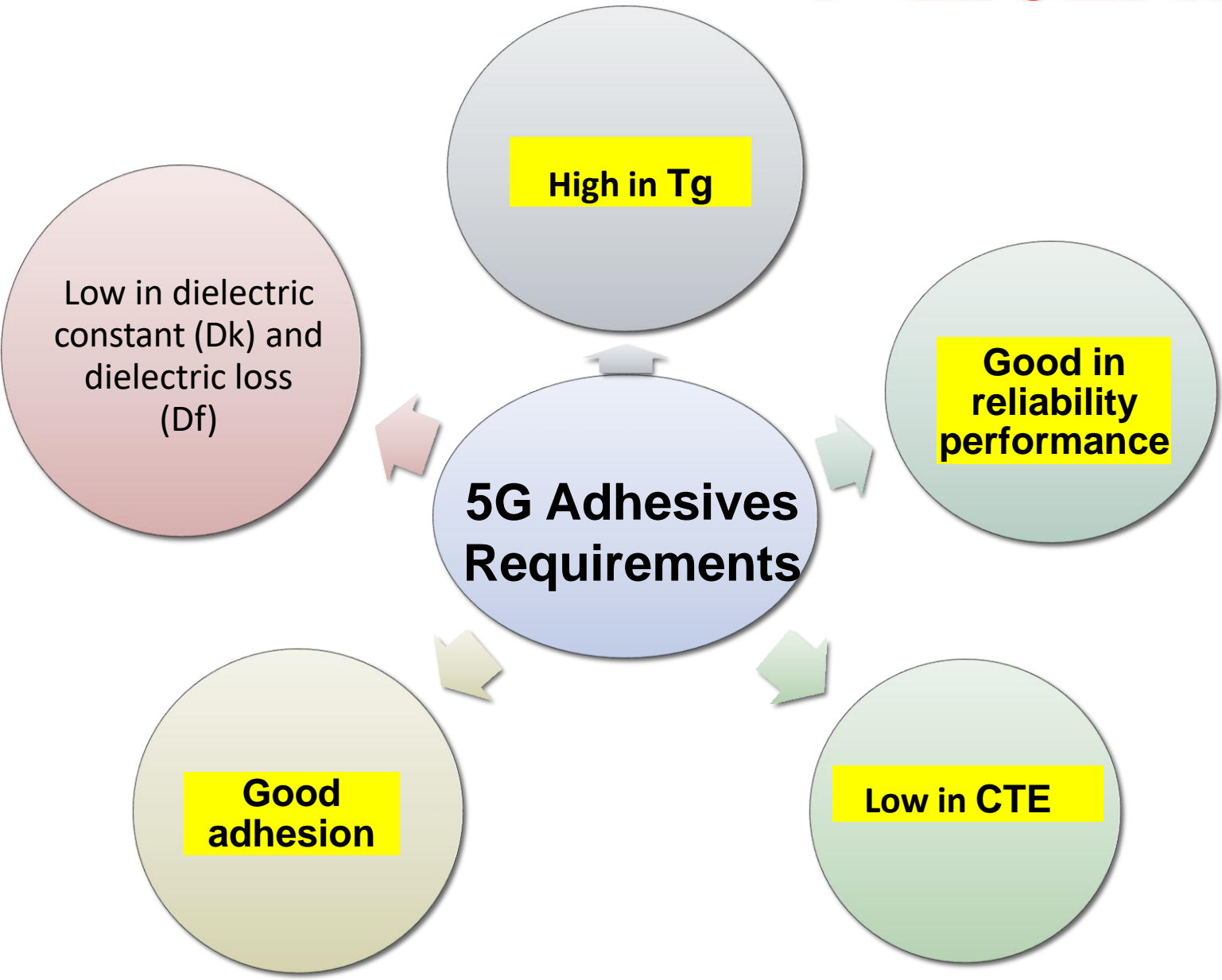


## Devices for Optical Fiber Communication



## Types of Optical Devices







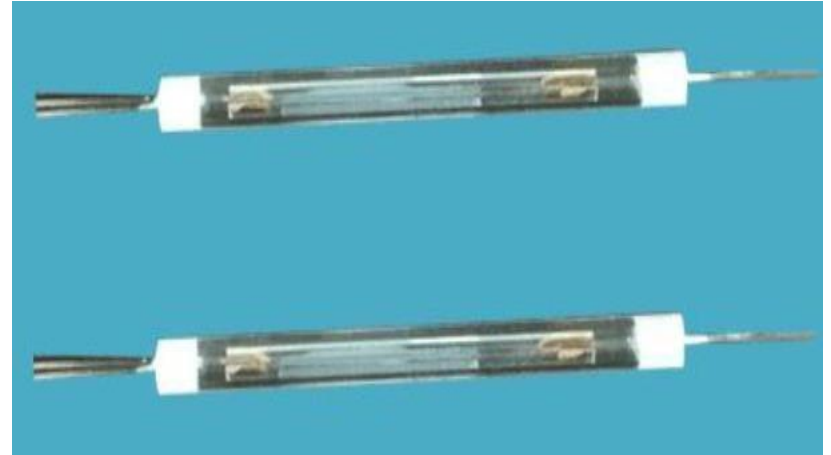
Optical Devices



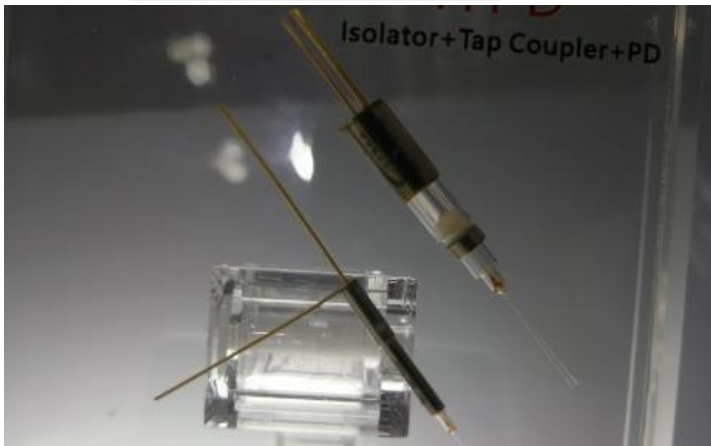
High Tg, Low CTE



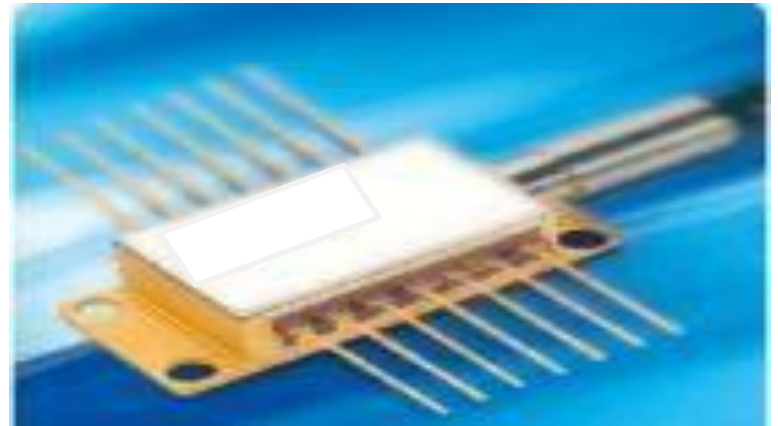
WDM



PLC



Opto-Isolator



MOQ



**Optical Telecommunication Reliability Test Conditions**

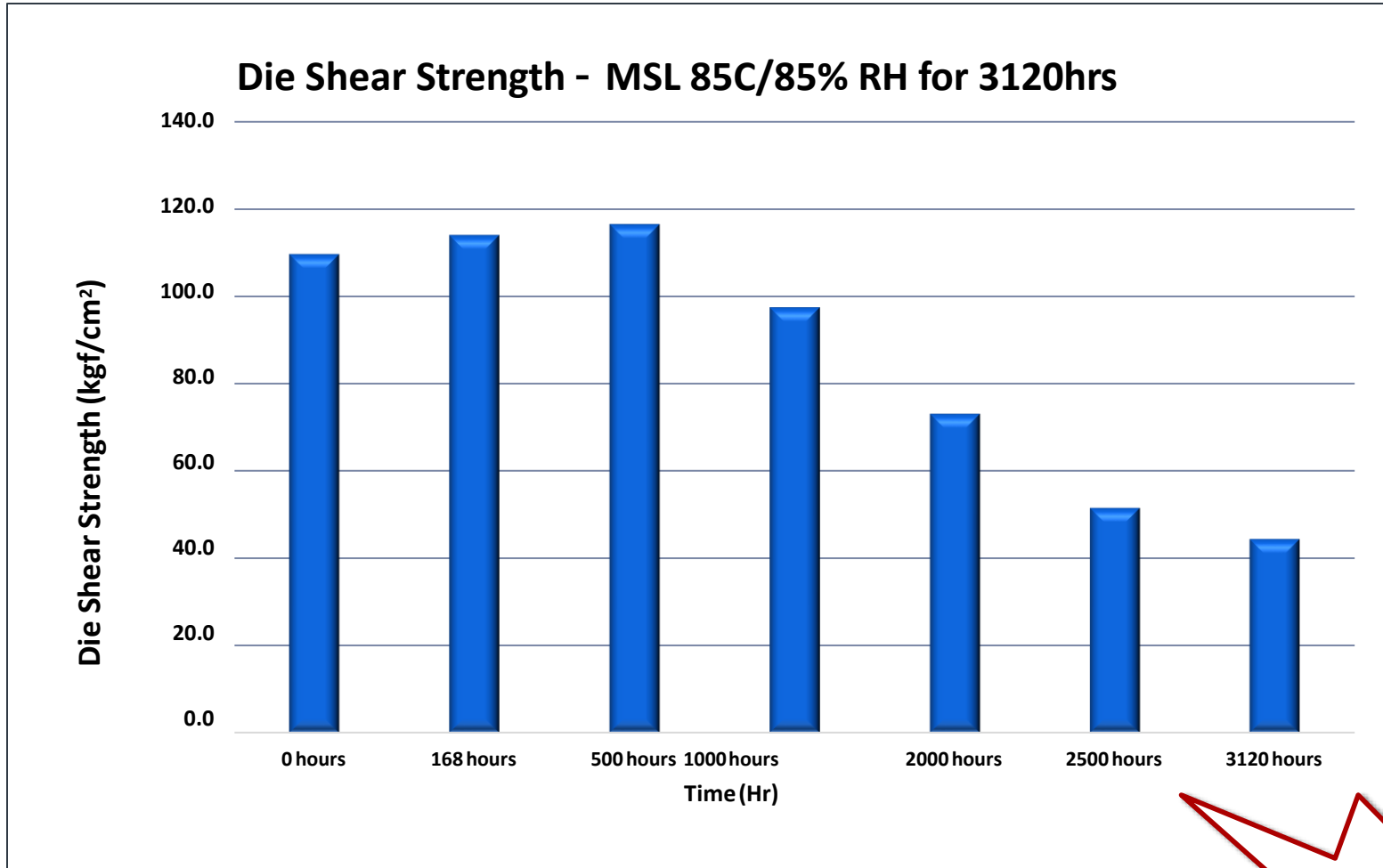
<b>Test 测试</b>	<b>Condition 条件</b>
<b>High Temperature Storage 高温储存</b>	85°C,1000 hr
<b>Low Temperature Storage 低温储存</b>	-40°C,1000 hr
<b>Dam Heat 双85测试</b>	85°C/85%RH,2000hr - 105°C/100%RH,2000hr
<b>Temperature cycling 冷热循环</b>	-40°C To 85°C,20°C/min ramp,10 min soak
<b>Mechanical Shock 机械冲击</b>	Condition A: 500G,1ms,5 times/axis
	Condition B: 1500G,0.5ms, 5 times/axis
<b>Thermal Shock 冷热冲击</b>	-40°C to 85°C, air to air (measured at 20 & 100 cycles)
<b>Vibration 振动测试</b>	20G,20-2000 Hz, 4min/cycle,4 cycles/axis

# Competitor Study vs Penchem Adhesive



Properties	Unit	E Brand	UV788-2
<b>Uncured Properties</b>			
Viscosity,25C 粘稠度	cP	30,000	<b>22,800</b>
Thixotropic Index 触变性	-	NA	1.2
Pot life 常温可用期	Days	2	2
90° Incline flow test, 25°C, 10 min 垂流流动	-	-	30
<b>Cured Properties</b>			
Density 密度	-	1.79	1.808
Glass Transition Temperature, Tg 玻璃转换温度	C	<b>130</b>	<b>140</b>
CTE 1 膨胀收缩系数	ppm/k	<b>14</b>	<b>23</b>
CTE 2 膨胀收缩系数	ppm/k	50	54
UV+Heat (Glass-metal) UV+Heat 拉力 (玻璃-玻璃)	Kgf/cm <sup>2</sup>	<b>160</b>	<b>180</b>
Outgassing 30°C-150°C 挥发量 (30°C-150°C)	%	<b>0.23</b>	<b>0.15</b>
PCT, 121°C,100%RH, 2atm for 48 hr 压力锅测试,48 hr	Kgf/cm <sup>2</sup>	<b>Delam</b>	<b>13</b>
Curing Condition 固化条件	-	2W/cm <sup>2</sup> , 15s + 100°C/1hr	2W/cm <sup>2</sup> ,15s + 100°C/1hr

## UV788-2 After MSL 85C/85%RH Adhesion Strength

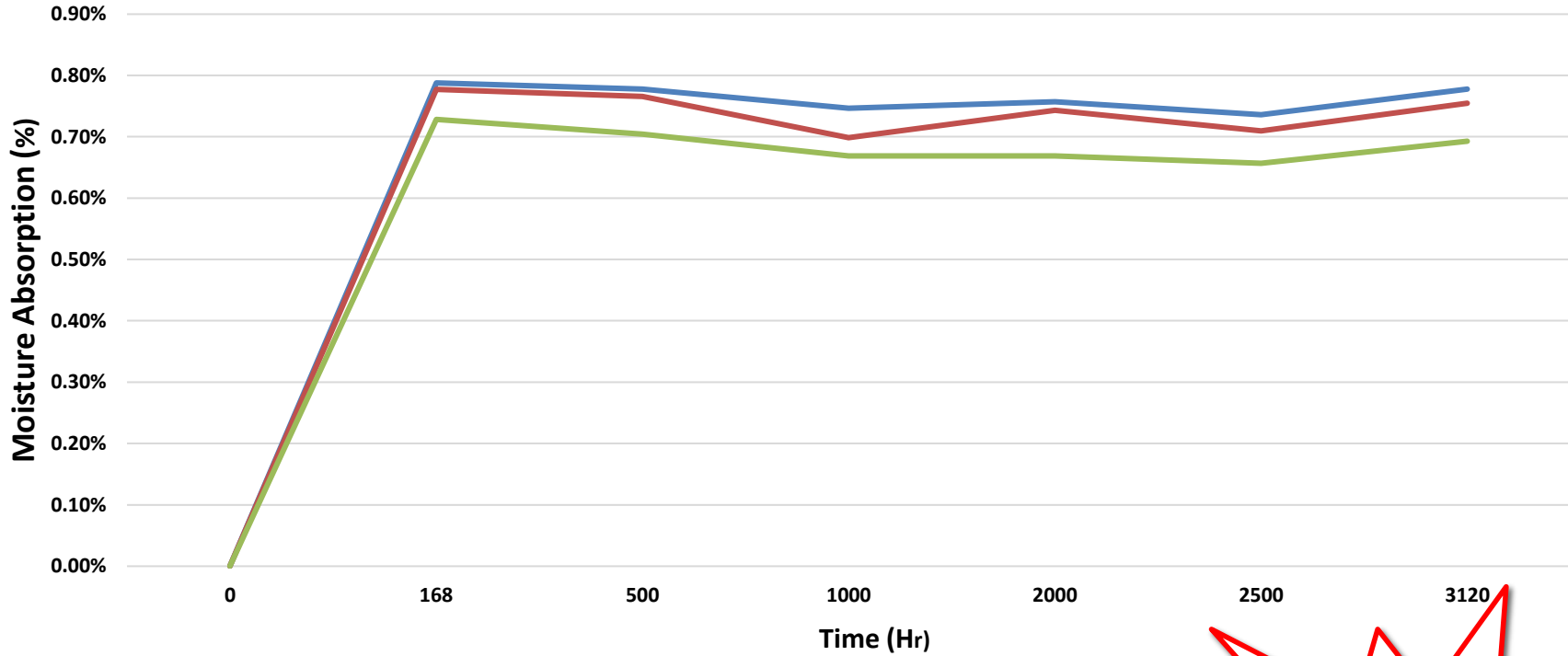


Glass-Metal substrate

Maintain >40% Adhesion Strength

## UV788-2 After MSL 85C/85%RH Moisture Adsorption

MSL 85C/85%RH for **3120hrs** Moisture Absorption %



Glass-Metal substrate

Moisture Absorption <0.8%

## CTE for UV788-2 After MSL 85C/85%RH @ Particular Temperature

Temperature, °C	Coefficient of Thermal Expansion, Ppm/K		
	0 hr	500 hrs	2000 hrs
-5	10.97	13.06	11.81
25	13.97	14.76	13.63
80	19.60	19.71	20.51

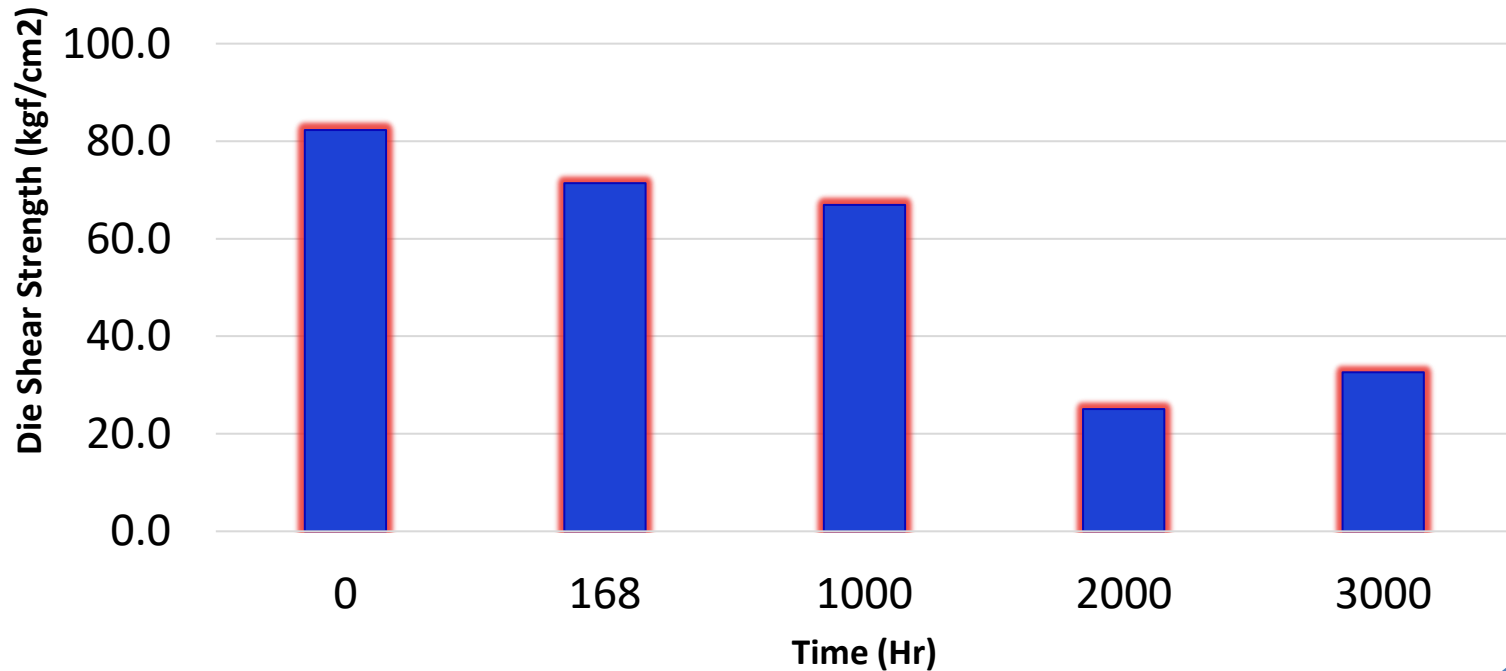
Remarks: CTE at particular temperature at -5, 25, 80°C after MSL 85C/85%RH



Properties	Unit	E Brand	UV799-2
<b>Uncured Properties</b>			
Viscosity, 25C 粘稠度	cP	67,000	<b>66,375</b>
Thixotropic Index 触变性	-	1.19	1.63
Pot life 常温可用期	Days	<b>2</b>	<b>3</b>
90° Incline flow test, 25°C, 10 min 垂流测试	-	-	1
<b>Cured Properties</b>			
Density 密度	-	1.85	1.808
Glass Transition Temperature, Tg 玻璃转换温度	C	120	120
CTE 1 膨胀收缩系数	ppm/k	24	25
CTE 2 膨胀收缩系数	ppm/k	92	54
UV+Heat (Glass-metal) UV+Heat 拉力 (玻璃-金属)	Kgf/cm <sup>2</sup>	<b>51</b>	<b>60</b>
PCT, 121°C, 100%RH, 2atm for 48 hr 压力锅测试, 48hr	Kgf/cm <sup>2</sup>	<b>Delam</b>	<b>No Delam</b>
Curing Condition 固化条件	-	2W/cm <sup>2</sup> , 15s + 120°C/1hr	2W/cm <sup>2</sup> , 15s + 120°C/1hr

## UV799-2 After MSL 85C/85%RH Adhesion Strength

### Die Shear Strength – MSL 85C/85% RH for 3000hrs

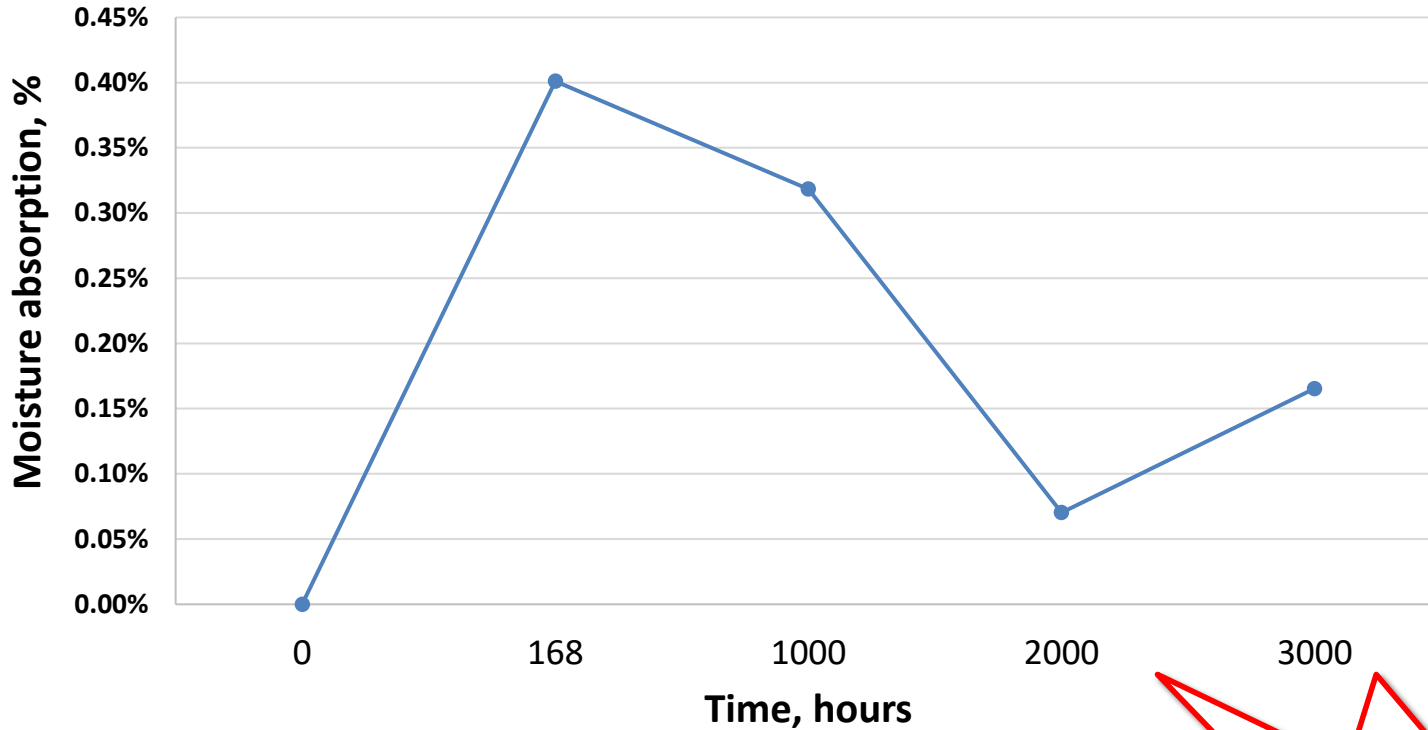


Glass-Metal substrate

**Maintain 40% of  
adhesion strength**

## UV799-2 After MSL 85C/85%RH Moisture Adsorption

MSL 85C/85%RH for **3000hrs** Moisture Absorption %



Glass-Metal substrate

Moisture  
absorption  
0.17%



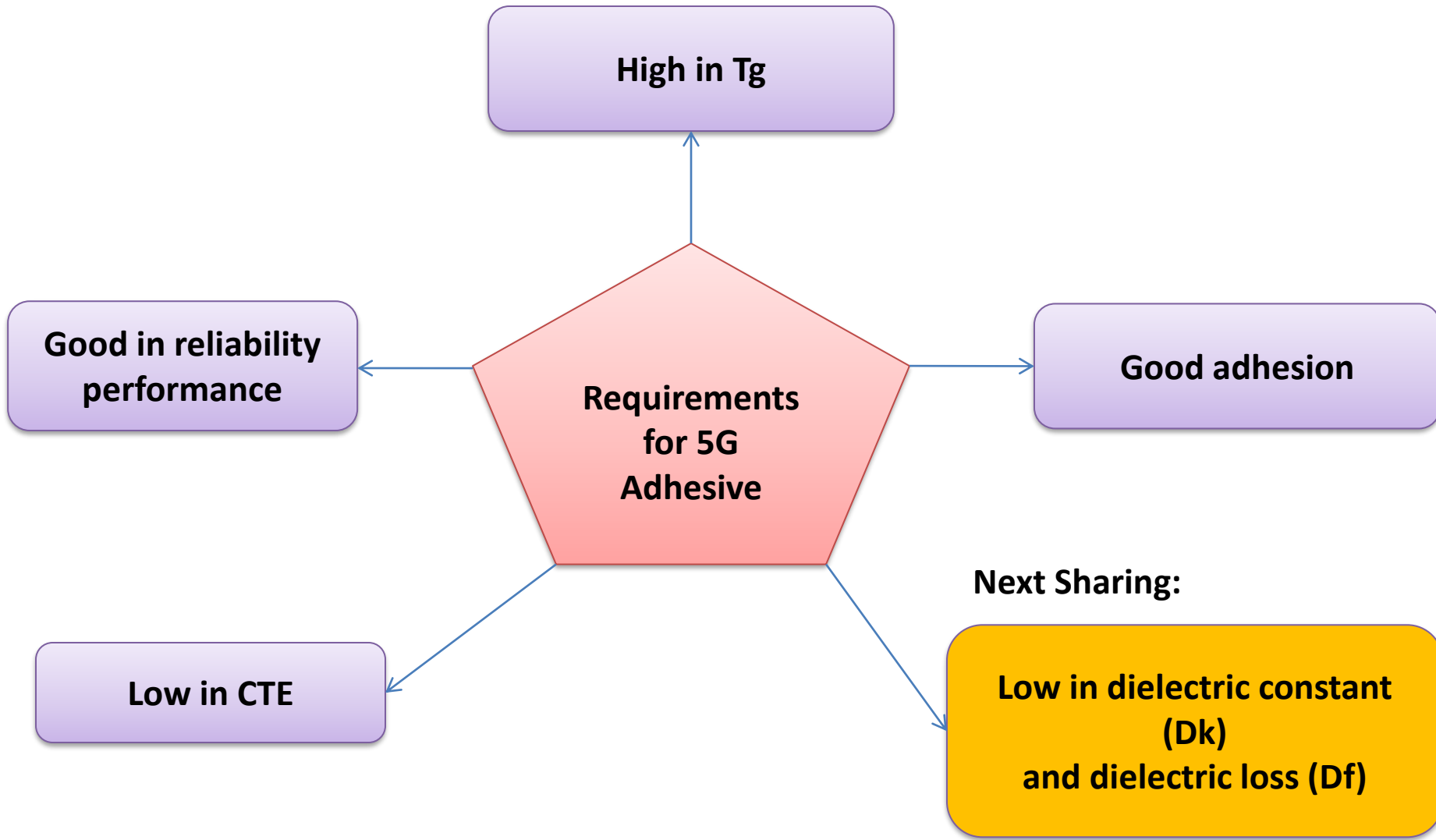
**CTE for UV799-2 After MSL 85C/85%RH  
@ Particular Temperature**

Temperature, °C	Coefficient of Thermal Expansion, Ppm/K		
	0 hr	2000 hrs	3000 hrs
-10	18.68	15.86	15.46
30	21.36	18.50	18.41
80	26.04	30.66	30.14

Remark: CTE at particular temperature at -10, 30, 80°C after MSL 85C/85%RH



Properties	Unit	UV799-3	UV799-4
<b>Uncured Properties</b>			
Viscosity, 25C 粘稠度	cP	<b>19,200</b>	<b>13,620</b>
Thixotropic Index 触变性	-	1.22	1.21
Pot life 常温可用期	Days	<b>7</b>	<b>7</b>
90° Incline flow test, 25°C, 10 min 垂流动	-	<b>42</b>	<b>54</b>
<b>Cured Properties</b>			
Density 密度	-	1.75	1.78
Glass Transition Temperature, Tg 玻璃转换温度	C	<b>134</b>	<b>113</b>
CTE 1 膨胀收缩系数	ppm/k	<b>29</b>	<b>28</b>
CTE 2 膨胀收缩系数	ppm/k	47	64
UV+Heat Adhesion UV+Heat 拉力	Kgf/cm <sup>2</sup>	<b>117 (glass-kovar)</b> <b>111 (glass-Nickel)</b>	<b>129 (glass-Kovar)</b> <b>119 (glass-Nickel)</b>
PCT, 121°C, 100%RH, 2atm 压力锅测试	Kgf/cm <sup>2</sup>	<b>No Delam</b>	<b>No Delam</b>
Curing Condition 固化条件	-	2W/cm <sup>2</sup> , 15s + 100-130°C/1hr	2W/cm <sup>2</sup> , 15s + 100-130°C/1hr



## THANK YOU!

For more information, please contact our technical and commercial team, who will be always pleased to help.

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