

Zytel[®] LCPA Portfolio



DUPONT



- Long Chain Polyamides Portfolio
- Key advantages of LCPA versus PA66
- Key advantages of LCPA versus PA12
- Key advantages of LCPA versus Hytrel®
- Main applications

Portfolio of LCPA

Portfolio

Zytel® LCPA Family	Polymer Type	RS Content
1000 Series	PA1010	20-100%
2000 Series	LCPA Blends	> 20 %
3000 Series	PA610	20-63%
4000 Series	CM PA610	20-60%
6000 Series 150 Series 77G Series	PA612	N.A.
7000 Series	CM PA612	N.A.

Zytel® LCPA Family	Polymer Type	Grade
Toughened PA6 & PA66	PA66	Zytel FN718 BK230A
	PA6	Zytel FN727 NC010A
Terpolymer	PA*	Elvamide 8061
	PA*	Elvamide 8063

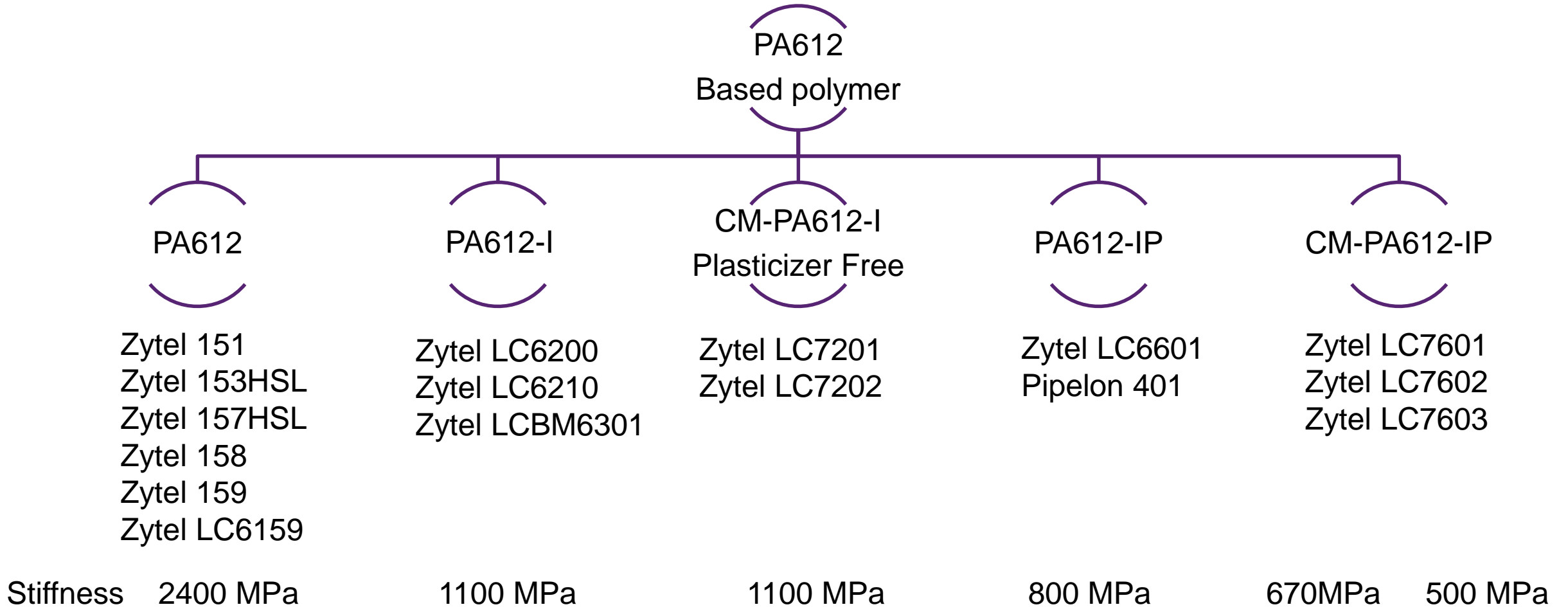


Zytel® RS renewably sourced polyamides contain 20% to 100% by weight of renewable content derived from a non-food crop that can be grown on marginal

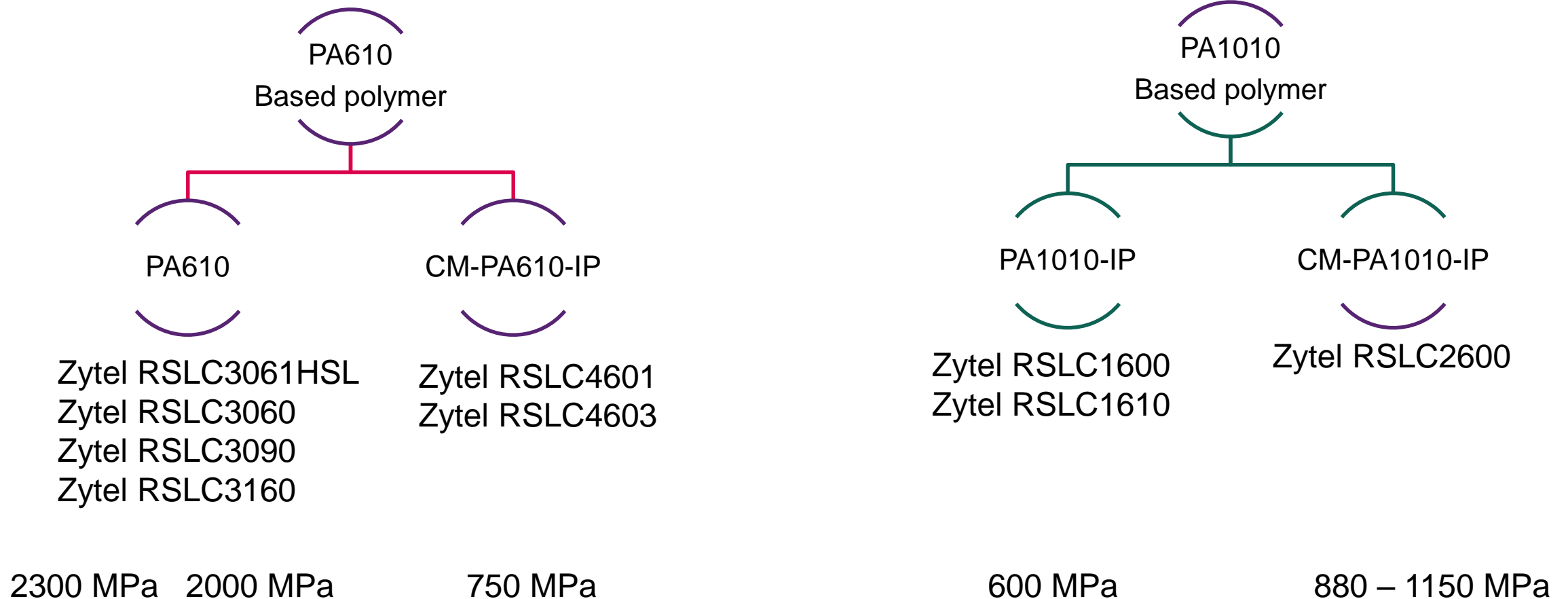
land with no maintenance.



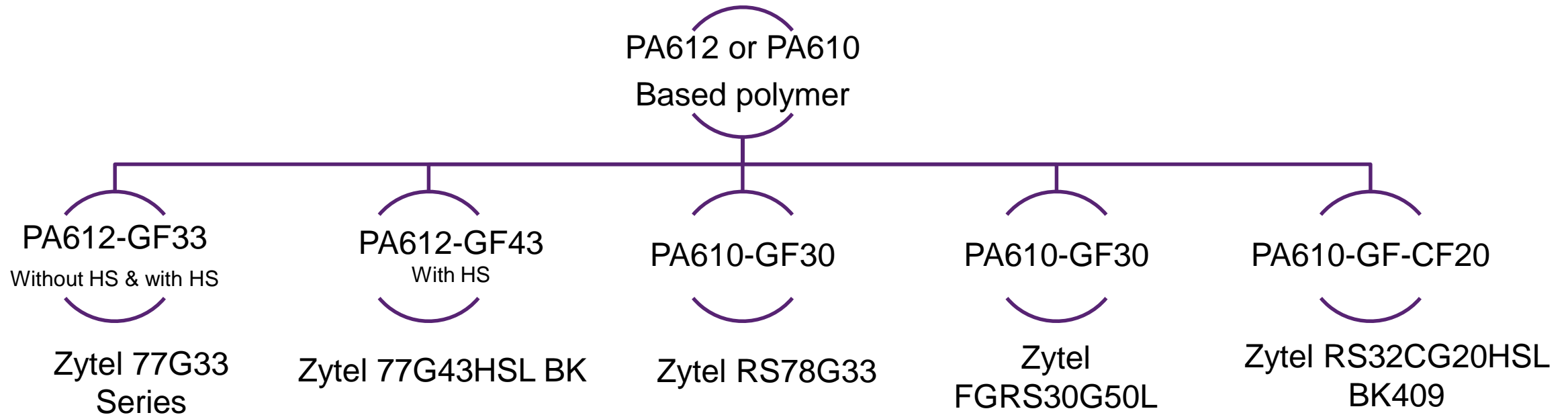
Overview of the Long Chain Polyamides subgroups for unreinforced grades for tubing applications



Overview of the Long Chain Polyamides subgroups for unreinforced grades for tubing applications






Overview of the Long Chain Polyamides subgroups for reinforced grades for structural applications

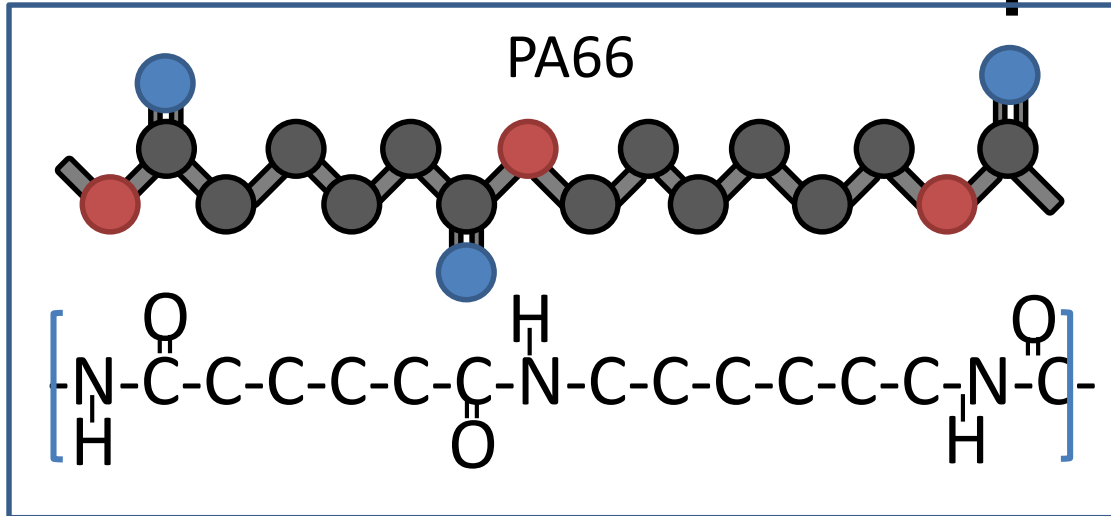


*Different functionalities
such as EF / improved for
thermal shock*

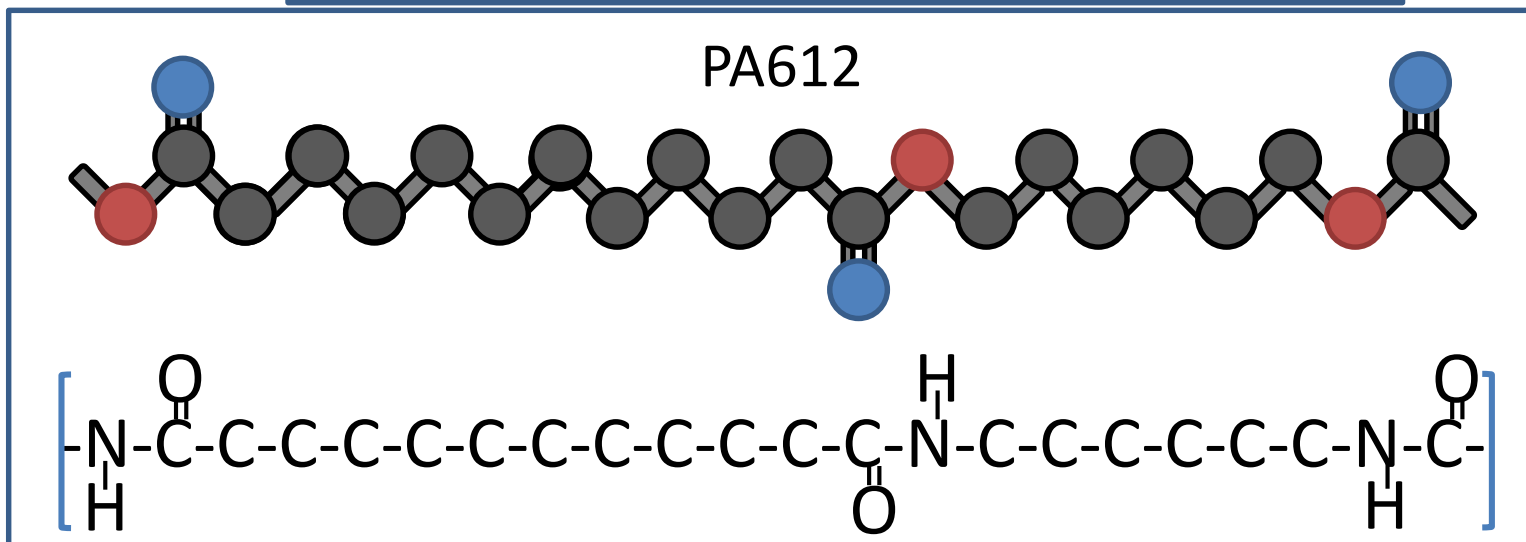
Key advantages of LCPA versus PA66

Their molecular structure allow Flexibility and lower moisture pick up

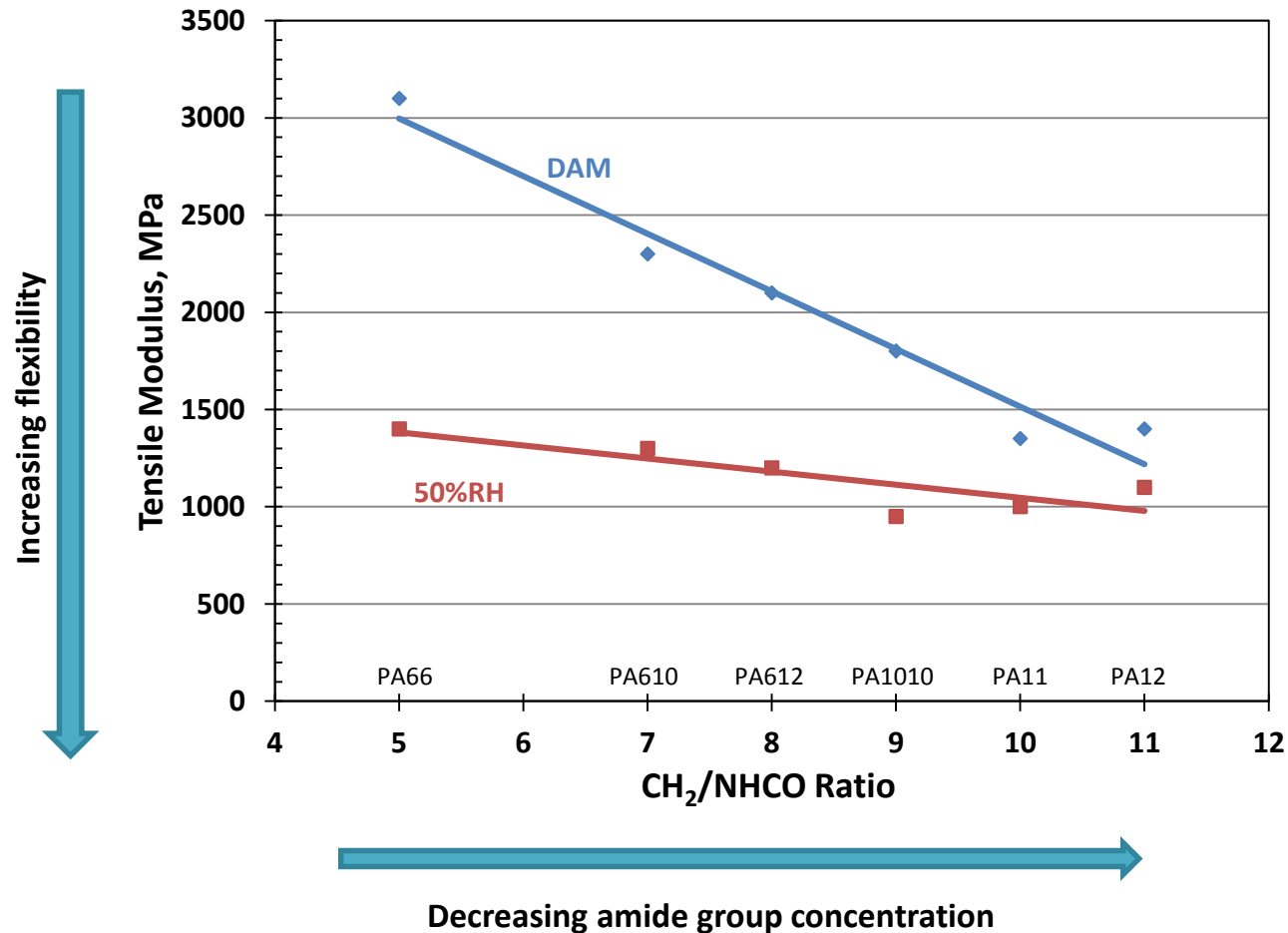
-  Oxygen
-  Nitrogen
-  Carbon



LCPA (such as PA612) has greater spacing between amide groups on average vs PA66 which will allow more flexibility and less sensitive to moisture pick up.

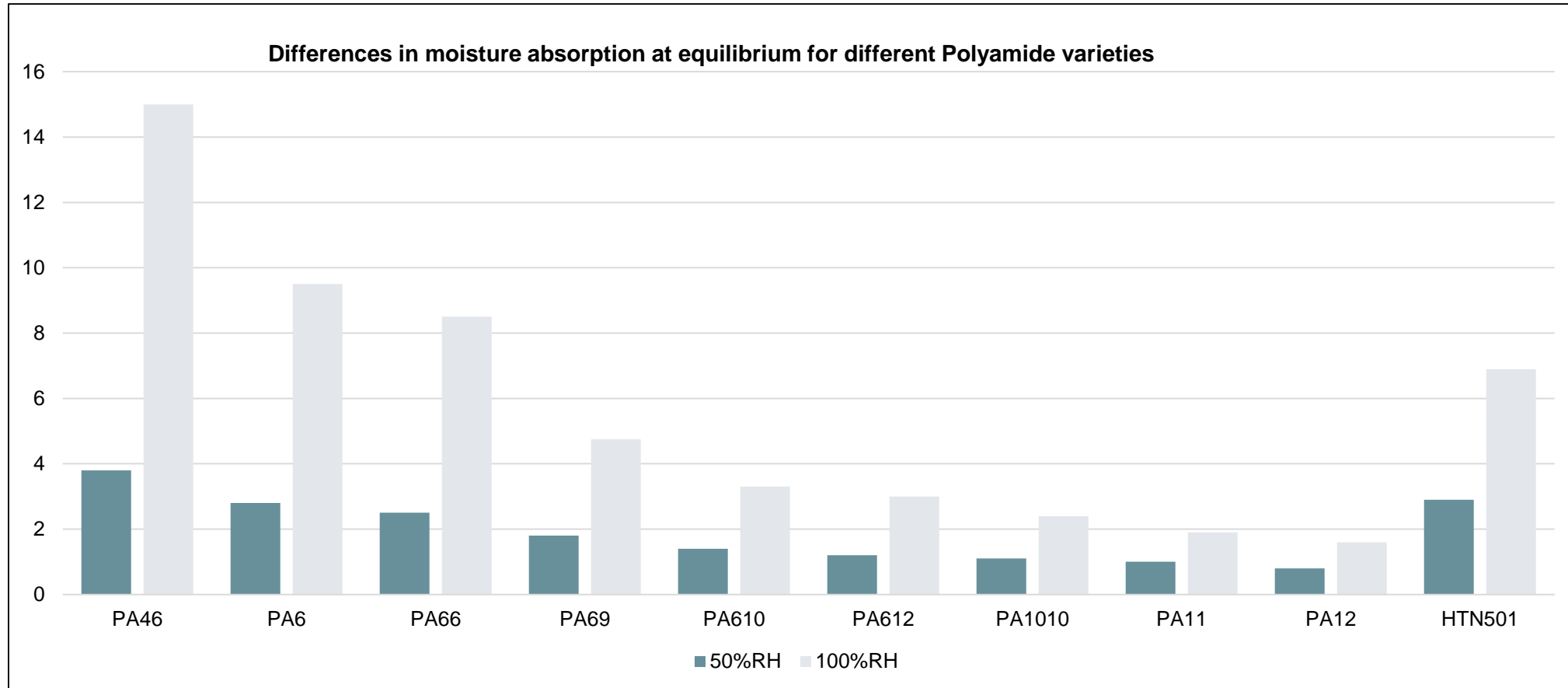


LCPA are less impacted by the moisture than PA66

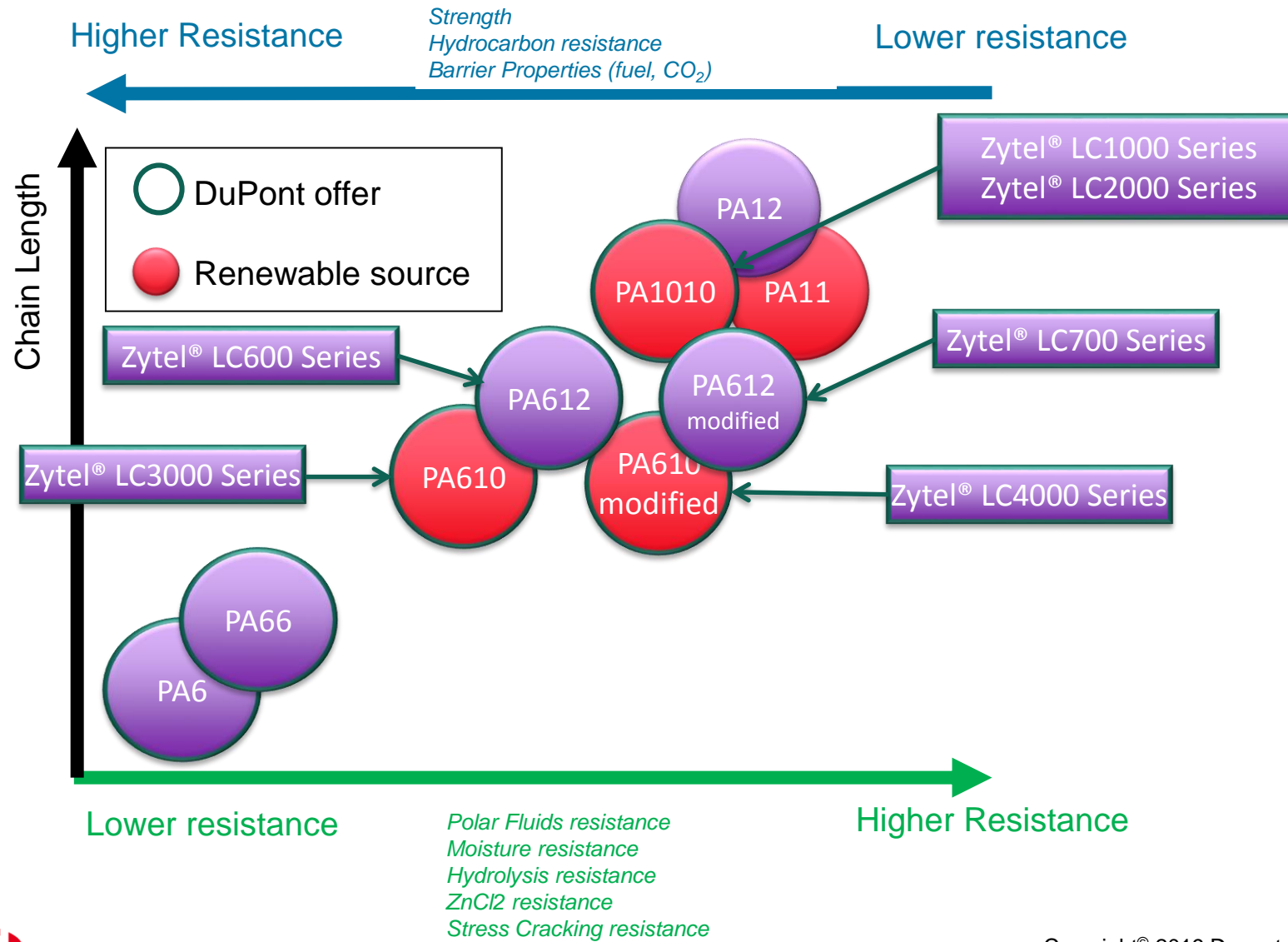


- Decreasing the amide group concentration allow getting more flexible materials.
- As the nylon polymer chain length increases, the effect of moisture on flexibility decreases.
- At 50%RH, the difference in flexibility for the various nylon polymers is significantly smaller than at DAM.

Moisture Level per polymer family



Better chemical resistance



Key advantages of LCPA versus PA12

Higher melting point

Decreasing amide group concentration 

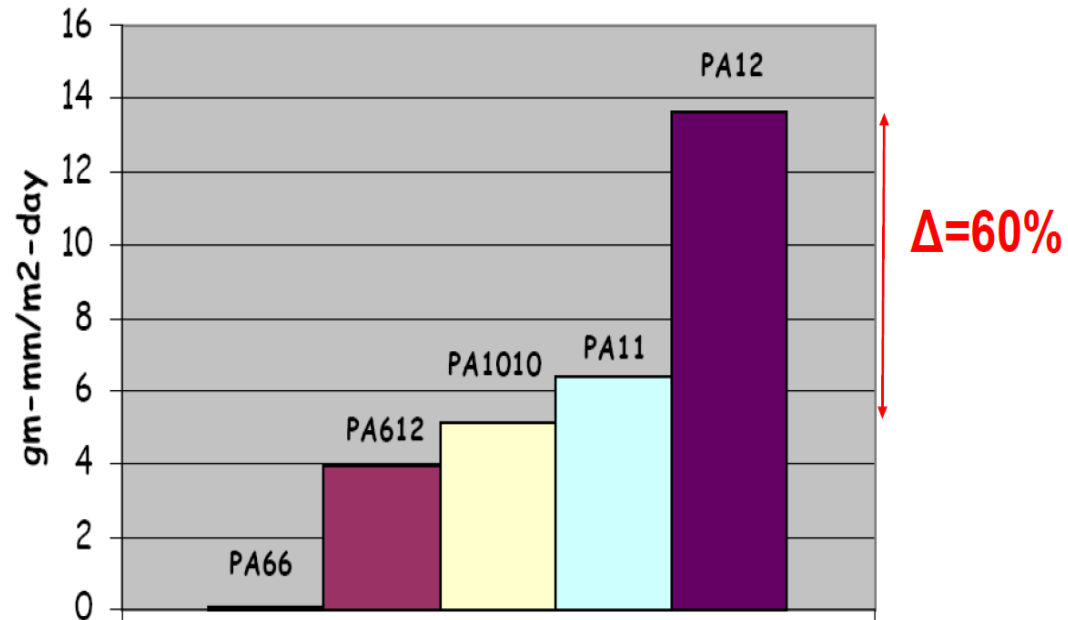
	PA66	PA610	PA612	PA1010	PA11	PA12
Properties that decrease with decreasing amide group concentration						
Tensile Yield Stress (MPa) - DAM State	82	65	62	52	43	45
Tensile Modulus (MPa) - DAM State	3100	2300	2100	1800	1350	1400
Tensile Modulus (MPa) - Conditioned State	1400	1300	1200	950	1000	1100
Water Absorption	2.5	1.5	1.3	1.1	1	0.8
Density	1.14	1.08	1.06	1.04	1.03	1.01
Melting Temperature (°C)	262	225	218	205	189	180
Properties that increase with decreasing amide group concentration						
Tensile Yield Strain (%) - DAM State	4.5	4.5	4.5	4.5	5	5
Tensile Strain at Break (%) - DAM State	50	100	150	> 100	330	250
Notched Charpy (kJ/m ²) - DAM State	5.5	5	4.2	5	8	6
Unnotched Charpy (kJ/m ²) - DAM State	NB	NB	NB	NB	NB	NB

Lower permeability to fuels and gases

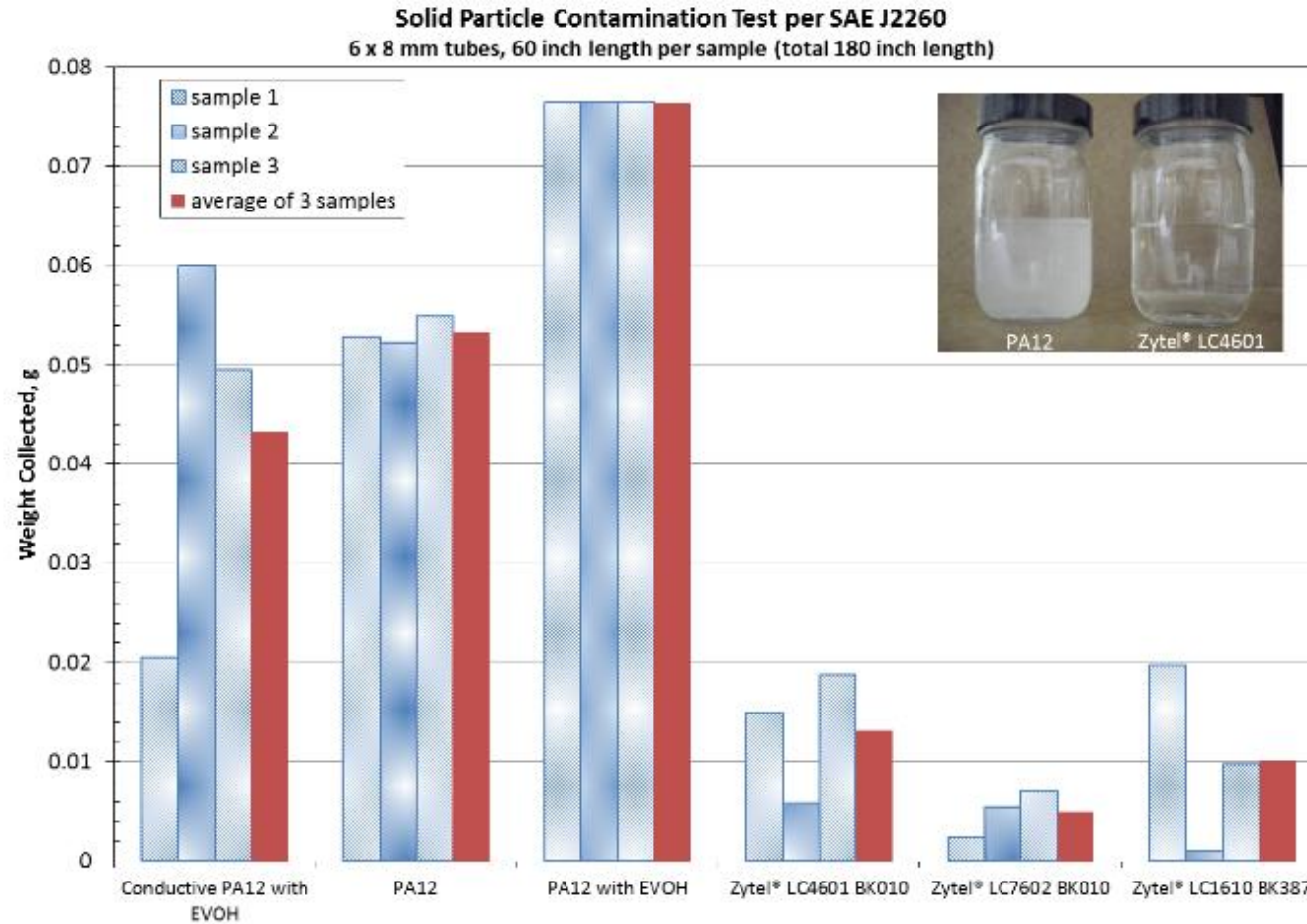
PA1010 vs. PA12

Barrier Efficiency to Fuel CE10 60% Reduction!

Permeability to Fuel CE10

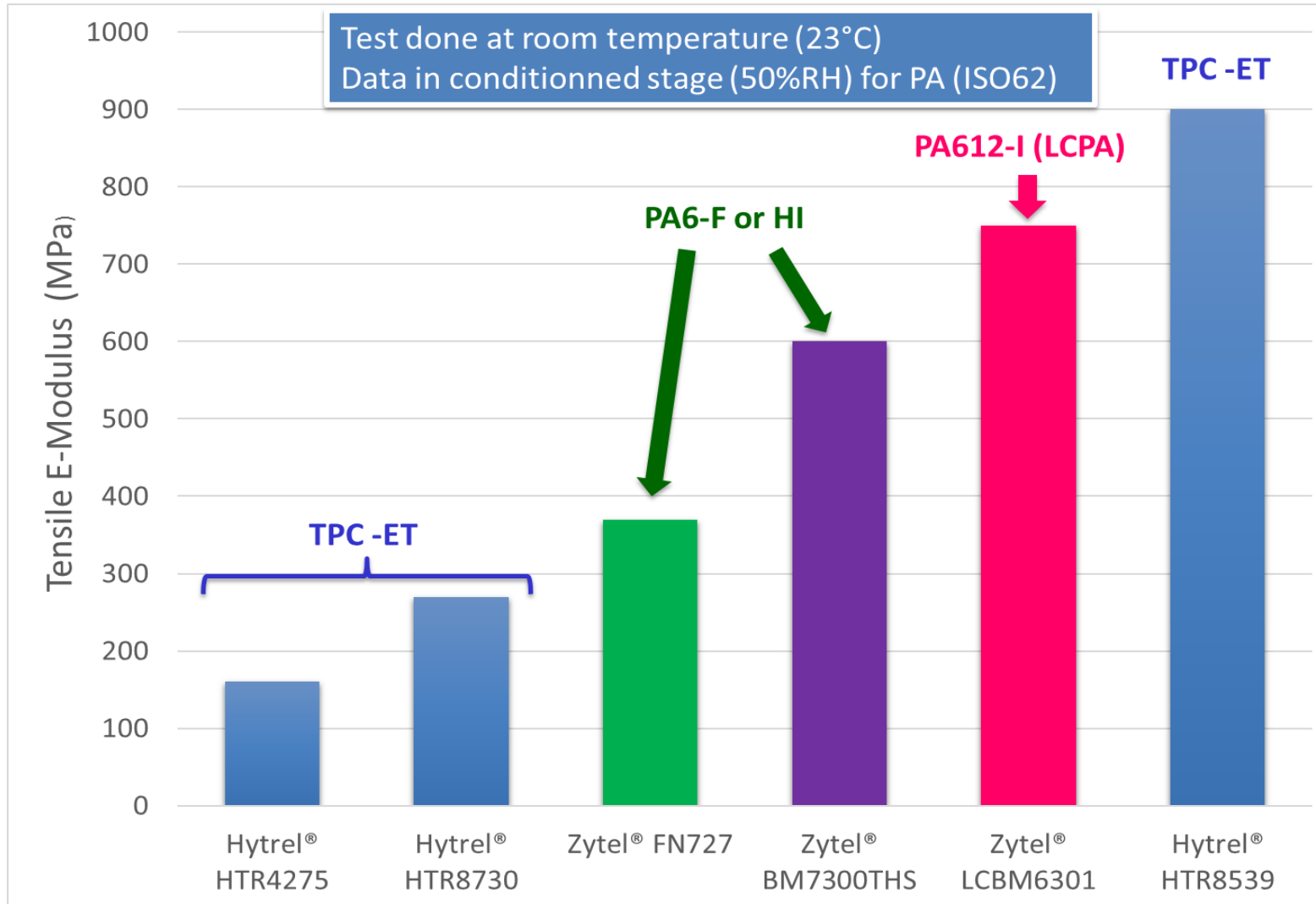


Lower oligomer content (fuel line applications)



Key advantages of LCPA versus Hytrel®

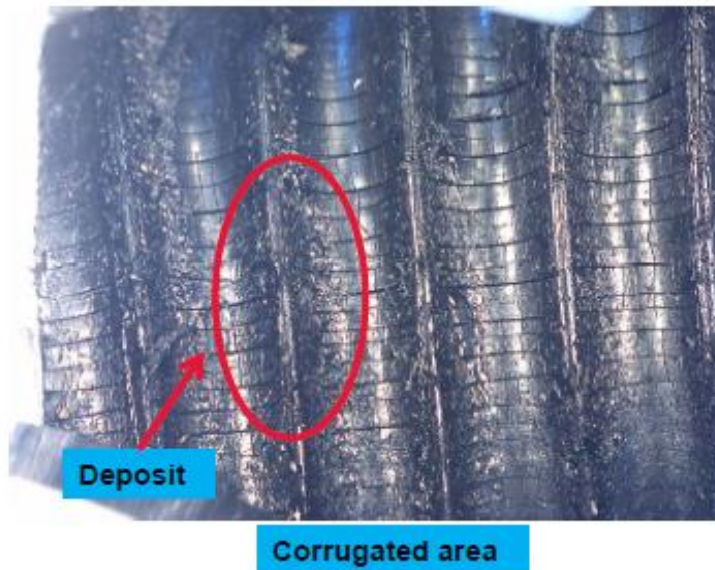
Grade Positioning: Stiffness comparison



Complementary offer from Polyamid Grades

Advantages of PA

Chemical Resistance



Example of Chemical Attacks

AOA Resistance



Example of Air Oven Ageing (AOA)

Applications for the Polyamides

Main Applications for Zytel® LCPA

Flexible Solution (Unreinforced grades)

Automotive Applications



Air brake tubing



Corrugated tubes



Fuel lines



Coolant Flex Pipes



Vacuum (servo) brake tube



Air Conditioning hoses

Filament Applications



Glass or Carbon Reinforced PA



Fuel Line Quick Connector



Radiator End tank



Battery seals



Auto Sensors



Hand Held Devices



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