

Polycarbodiimides: Classification-free and your most sustainable crosslinker

Stahl Polymers



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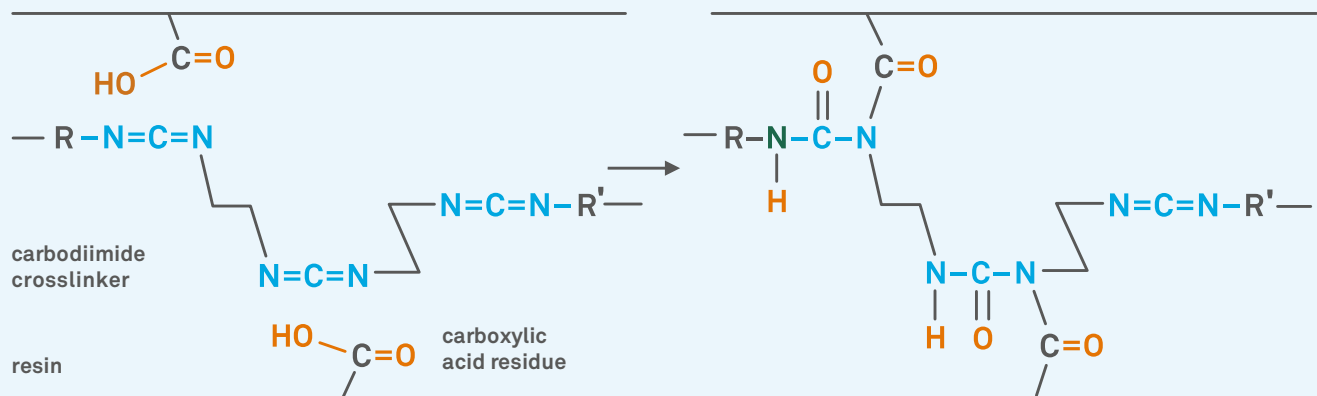
Crosslinking is widely practiced in nearly all the coatings industries like printing and packaging, paints, flooring and industrial coatings in order to improve the performance. These improvements include wear, abrasion and chemical resistances, adhesion and toughness.

Polycarbodiimides do contain the carbodiimide reactive group, sometimes combined with other functional reactive groups. However, importantly, are not harmful, irritant, sensibilizing nor toxic, as has been determined in toxicological studies. Hence, do not carry any classification so as a consequence, polycarbodiimides are safe and the best possible sustainable crosslinker choice.

An important crosslinking system for aqueous resins involves the use of water-dispersible oligomeric polyisocyanates. Main drawbacks are their sensibility to moisture and their limited pot life. Aziridines are another type of crosslinker

and they were for a long time the reference standard for performance development; however, their use is decreasing enormously in specific applications due to their toxicity, handling limitations and serious health risks. Even latest new aziridines developments, are still classified so are still not the right choice from the point of view of safety, sustainability and friendly use.

The chemistry of polycarbodiimide crosslinking involves mainly the reaction of carboxylic acid residues ($-\text{COOH}$) in acrylic resins or in polyurethane dispersions with carbodiimide ($-\text{N}=\text{C}=\text{N}-$) groups of the crosslinker. Since the polycarbodiimide contains several $-\text{N}=\text{C}=\text{N}-$ groups, one polycarbodiimide molecule can react with carboxylic acid residues on different polymer chains tying them together forming a three-dimensional network. Reaction of carboxylic acid with carbodiimide can be quite fast under ambient or mild thermal curing conditions:



Benefits of Carbodiimides



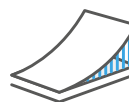
Low toxicity reduces labeling requirements



Improve chemical and scratch resistance



Quick and efficient processing: crosslinks at room temperature; no need for stoving



Outstanding adhesion to wide range of substrates



Excellent potlife: up to several weeks depending on pH



Swiss ordinance compliant for indirect food contact

Carbodiimide crosslinkers

Product	Description	Solids (%)	Viscosity (cP)	Solvent system	VOC (%)	Recommended dosage (%)	Curing (°C)	Special features, benefits and uses
Picassian® XL-701	Multifunctional polycarbodiimide	50.0	50-300	MPA	49.9	4-8	RT	For use in solvent- or water-based resins. High reactivity.
Picassian® XL-702	Polycarbodiimide	40.0	70-300	H ₂ O	0.0	4-10	RT	Long pot-life. Zero-VOC. For exterior use. Non-yellowing.
Picassian® XL-721	Multifunctional polycarbodiimide	50.0	50-400	PGDA	48.1	4-8	RT	Very fast curing speed. Improves chemical and abrasion resistance.
Picassian® XL-725	Multifunctional polycarbodiimide	100	< 2,000	-	0.5	3-6	RT	For use in solvent- or water-based resins. High reactivity.
Picassian® XL-732	Polycarbodiimide	40.0	< 150	H ₂ O	0.0	4-10	RT	Extended pot-life. Zero-VOC. For exterior use. Non-yellowing.
Picassian® XL-752	Polycarbodiimide	30.0	< 150	H ₂ O	0.0	4-8	RT	Very long pot-life and excellent hydrolysis resistance. Zero-VOC. For exterior use. Non-yellowing.
Picassian® XL-755	Multifunctional polycarbodiimide	100	9,000	-	0.0	4-8	RT	Swiss ordinance compliant for indirect food contact. High reactivity.
Picassian® XL-762	Polycarbodiimide	100	19,500	-	0.0	4-8	RT	Improves chemical, abrasion and scratch resistance. VOC-free.

Latest developments:

Picassian® XL-755

It is a 100% solids multifunctional polycarbodiimide crosslinker, VOC-free and Swiss Ordinance approved for indirect food contact. It is included in our special range called multifunctional polycarbodiimides. This means that it contains additional functional groups which have a reactivity towards functional groups in the resin or towards corresponding groups. This results in an increased crosslinking capacity, since both the carbodiimide and the additional reactive functional group contribute to the crosslinking. So it provides high reactivity and excellent performance in many industries, including coatings, paints and printing & packaging applications.

Picassian® XL-762

It is a 100% solids polycarbodiimide crosslinker, VOC-free and offers very long pot life, up to several weeks in some formulations, depending on the type of resin and the type of the other components in the application mixture. It can be used in zero VOC systems and improves chemical, wear and abrasion resistances.

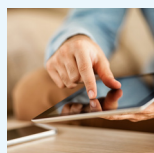
Products can be used in the following industries:



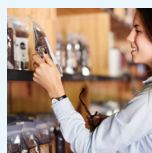
Parquet flooring



Concrete coatings



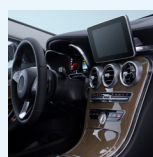
Electronic devices



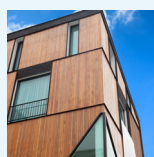
Printing and packaging



Furniture coatings



Automotive plastics



Outdoor wood coatings



Metal coatings

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