

## Toxicology and safety

POLYCROSS® cross-linking agents are a specific variety among cross-linking agents and they are particularly effective in reducing health risks and can be used in most industrial production environments.

As regards handling, POLYCROSS® range does not present any serious risks since they do not contain dangerousness components. We recommend for the operator or handler to use the same protection as when handling intermediate chemical products since, as is the case with many other substances, there may be some interaction between the cross-linking agents and the skin proteins.

Conventional blocked isocyanate, when they exceed 80° C, begin the process of inverting to isocyanate monomer and to blocking agent; this moment can be detected because the blocking agent tends to volatilise giving off a very aromatic, penetrating smell. This is the moment with the greatest toxicological danger since, after this time, a slow reaction begins which continues until the reaction temperature of the isocyanate monomer with the polymer to be cross-linked and the textile substrate is reached, while the blocking agent remains in the air of the drying chamber, producing secondary reactions with the compound.

In order to minimise this phenomenon, POLYCROSS® blocked cross-linking agents use specific blocking agents for each type of isocyanate, which are as close as possible to its point of reaction. In this way, the temperature difference between unblocking and the reaction of the isocyanate monomer with the polymer is reduced. The toxic risks of drying at these temperatures are therefore reduced by selecting and designing isocyanate adducts with low levels of free monomer by means of a quick reaction, since it is these monomers and the reactive blocking agents at low temperatures that cause most of the problems associated with these products.

The development of POLYCROSS® blocked cross-linking agents for applications in generalised processes has been obtained through improved understanding of these mechanisms in the process of unblocking isocyanate and, although it is true that these products are not so effective at low temperatures, they do fulfil all their expectations when working at temperatures higher than 110° C, and reach their maximum efficiency and minimum risk when working at temperatures higher of these temperature.

For the polyfunctional crosslinking types POLYCROSS® the specified compliance should be noted on each Safety Data Sheet (MSDS) for proper handling and the Technical Data Sheet where the use for each application is specified. These products no present problems with reaction of sub products by not containing blocking agent but containing free NCO in controlled amounts may be susceptible to allergies in sensitive people generate.

*At the date of publication of this catalogue (October 2014) all POLYCROSS® range products can be used without problems to meet among others the following requirements and regulations: Oeko-Tex® Standart 100 version 04/2014; REACH (SVHC) version 2014-06-16; IKEA IOS-MAT-0010 version 2013/05/10; IKEA IOS-MAT-0054 version 2013/06/07; H&M Chemical Restrictions version 2014/05/22; CTW version 2010; M&S version 2.1 January 2014; Carrefour V.10 - Summer 2014.*



## POLYCROSS® crosslinker range

Denomination	Description	Composition	Ionicity	Reaction Temp.	Application recommended
POLYCROSS® - NI	Blocked isocyanate	HMDI/DMP	Non ionic	130°C	Crosslinker for complex formulations for water and oil repellence Polyfluor and Polyguard. It gives HL and DC fastness.
POLYCROSS® - TBI 50	Blocked isocyanate	HDI/DFM	Anionic	110°C	Crosslinking agent for polyurethane and acrylic dispersions, PURLASTIC & POLYACRIL
POLYCROSS® - FC NEW	Blocked isocyanate	HDI/DFM	Cationic	140°C	Crosslinker for Polyfluor fluorocarbon resins. It gives HL and DC fastness.
POLYCROSS® - RT ECO	Polyfunctional isocyanate	PCD	Non ionic	110°C	Generic crosslinker for pigment pastes and continuously pad dyeing.
POLYCROSS® - 6822	Polyfunctional isocyanate	HDI	Non ionic	40°C	Crosslinker for polyurethane and acrylic-polyurethane dispersions. Excellent resistance to hydrolysis.
POLYCROSS® - 6887	Polyfunctional isocyanate	HDI	Non ionic	40°C	Crosslinking polyurethane dispersions employed for high performance textiles coating.
POLYCROSS® - HLP	Polyfunctional isocyanate	HDI	Non ionic	40°C	Crosslinker for fluorocarbon resins Polyfluor, conferring LAD properties.
POLYCROSS® - FF	Glyoxal	MDEU	Non ionic	120°C	Crosslinking agent employed as dimensional stabilizer for cotton and viscose. Free of formaldehyde.
POLYCROSS® - GLX	Glyoxal	MDEU	Non ionic	130°C	Crosslinking agent, employed as dimensional stabilizer for cotton and viscose very low formaldehyde content. No need catalyst.
POLYCROSS® - LF	Glyoxal	MDEU	Non ionic	130°C	Crosslinking agent, employed as dimensional stabilizer for cotton and viscose with very low formaldehyde content.
POLYCROSS® - MLC	Melamine	CH*	Anionic	140°C	Crosslinker agent, employed to increase the film forming ability of the dispersions, gives hardness and strength to HL washed.
POLYCROSS® - TQX	Blocked isocyanate	TDI/Ethyleneimine	Anionic	80°C	Crosslinking agent for printing.
POLYCROSS® - BTN	Melamine	CH*	Non ionic	140°C	Crosslinking agent used to achieve high hydrostatic head.

\*CH = Heterocyclic compound

WOR = Water & oil repellent

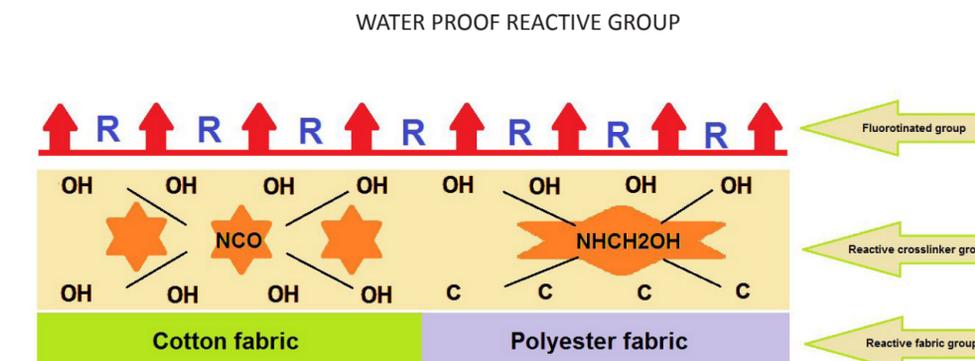
HL = Home Laundry

DC = Dry Cleaning

LAD = Laundry Air Dried

## Mechanisms that impart durability of POLYCROSS® crosslinker

Unlike mechanisms to impart laundering durability to the same finishing effected on different fibers with different crosslinking agent with a waterproofing resin applying (POLYGUARD - ECO PLUS).



Graphic 1

Graphic 2

Graphic 1

Formulation used for Cotton 100% WOR and 10 HL resistance

- DYEWET FC 1 gr/L
- POLYGUARD ECO PLUS 40 gr/L
- POLYCROSS HLP<sup>1</sup> 10 gr/L

Pick-Up: 85%

T<sup>®</sup> Dried: 120°C

Graphic 2

Formulation used for Polyester 100% WOR and 10 HL resistance

- DYEWET FC 1 gr/L
- POLYGUARD ECO PLUS 25 gr/L
- POLYCROSS MLC<sup>2</sup> 5 gr/L

Abortion 68%

T<sup>®</sup> Dried: 160°C

<sup>1</sup> Polyfunctional crosslinking agent

<sup>2</sup> Melamine crosslinking agent

## Blocked isocyanate POLYCROSS®

POLYCROSS® blocked isocyanate are the result of synthesising the reaction between an isocyanate and a protection element (commonly called blocking agent) to produce an isocyanate adduct with no free NCO groups, which is stable in resin preparations with temperatures up to almost 60° C.

POLYCROSS® cross-linking agents, among others, are used in coating, printing, adhesive, water-repellent formulations, etc, which are applied to various textile substrates with resins that have a polymeric structure capable of organising itself according to temperature; allowing the functional groups of the isocyanate to react with the reactive groups of the polymer and of the fabric, resulting in compounds with high molecular weight.

The thermal dissociation of this blocked isocyanate produces a variety of link mechanisms according to the composition of the actual polymer to be cross-linked. Normally, the groups of the isocyanate react with the aromatic nuclei between 80 and 100° C and with the aliphatic groups between 120 and 150° C. The process of dissociation by temperature of this type of cross-linking agents is merely the opposite of the reaction between the isocyanate and the blocking agent. In the specific case of the POLYCROSS® series, the blocking agents remain stable until 80° C and begin to dissociate with energy after 110° C due to a complex proton exchange system.

In the dissociation process, the proton joined to the nitrogen atom in the urea allows the transfer of the adjacent proton corresponding to the nitrogen atom of the blocking system, causing the subsequent reorganisation of the ring when the temperature rises above 100° C. The transfer of the protons at temperatures below that mentioned above is cancelled out by the presence of hydrogen atoms belonging to the polymer or polymers to be cross-linked.

It is important to stress that the final properties of a finish with resins can rarely be attributed to a single component of the formulation, but the use of an isocyanate makes it possible to obtain measurable values, such as resistance to abrasion, to hydrolysis, adhesion, solidity to washing and light, etc., unlike formulations that do not contain isocyanate.

## Polyfunctional isocyanate POLYCROSS®

POLYCROSS® the polyfunctional isocyanate are divided into two groups; isocyanurates based on hexamethylene diisocyanate with free NCO groups and based polycarbodiimides. They are suitably modified to be readily emulsifiable polyurethane dispersions and acrylic.

The reaction of the NCO group is effected with the OH groups of the dispersion and the textile substrate, providing crosslinks between the polymer layer and the fabric of high physical and chemical resistance. The polyfunctional crosslinking POLYCROSS® act at low temperatures due to their reactivity have a pot-life of the limited mixtures.

## Heterocyclic compounds POLYCROSS®

The crosslinking POLYCROSS® derivatives of modified N-methylol dihydroxy ethylene urea and melamine-formaldehyde partly etherified are low or no formaldehyde content and are used in the dimensional stabilization of fabrics of cotton or viscose and also for fixing textile finishing. They have excellent resilience and filming on the textile substrate, making it ideal for crease-resistant and non-shrink finish them.



Polysistec started its activities in 1995, initially focusing on the design, manufacture and sale of chemical products for the textile industry. Later in the year 2005 the company began a diversification strategy creating the Industrial Business Unit which offers products for different sectors.

The continued research for new products and applications along with a policy of sustainability and respect for the environment have led to a progressive and constant presence in markets around the world.

In the facilities of Castellar del Vallès (Barcelona) R & D developments are performed in order to respond to each of their clients' needs. All this combined with the continued assistance provided by our Technical & Sales department, are the basis of the business.



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POLYCROSS® crosslinker agents



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