



LANXESS
Energizing Chemistry

Low Free Urethane Prepolymers as Building Block for High Performance Protective Coatings

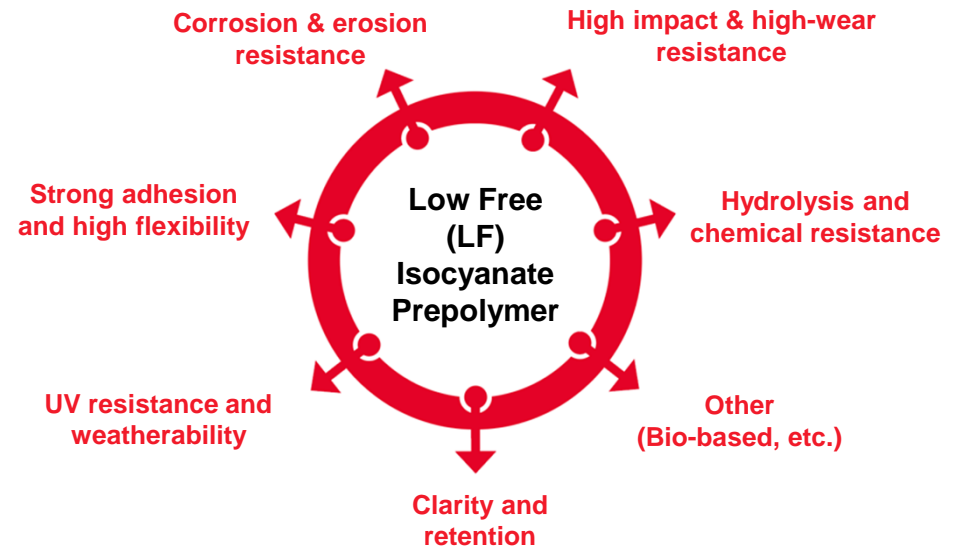
LANXESS Urethane Systems (URE)

LANXESS aliphatic Trixene[®] and Adiprene[®] LF specialty prepolymers for coatings

Industry applications for 2K urethane coatings

- Coating formulators offer high performance 2K urethane coatings in several applications like
 - **Aviation**
 - **Marine**
 - Transportation
 - Industrial
 - ACE
 - Sports
- Esp. demanding applications like Aviation and Marine need long term performance under severe conditions
- LANXESS offers **specialty prepolymers** with unique properties to **support these applications**

Key features of high performance 2K coatings

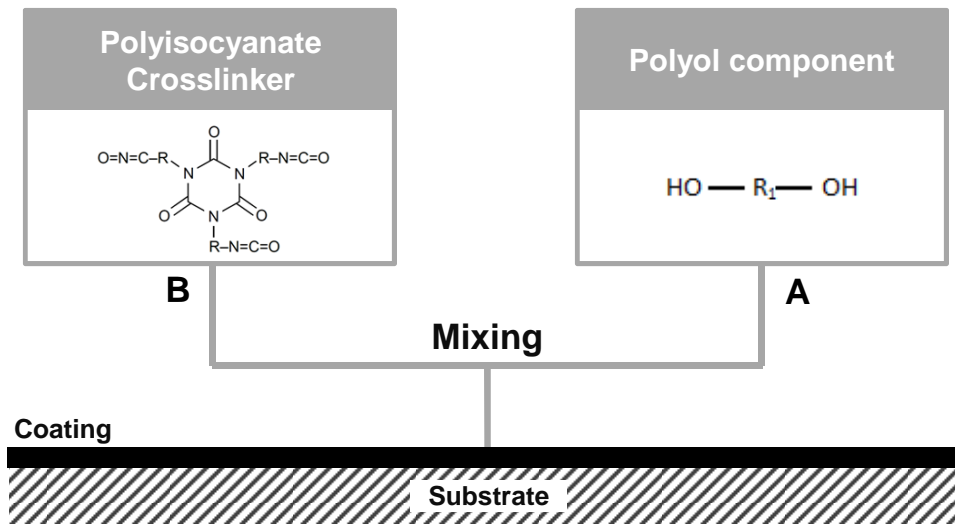


X Adiprene[®] LF
Low Free Prepolymers

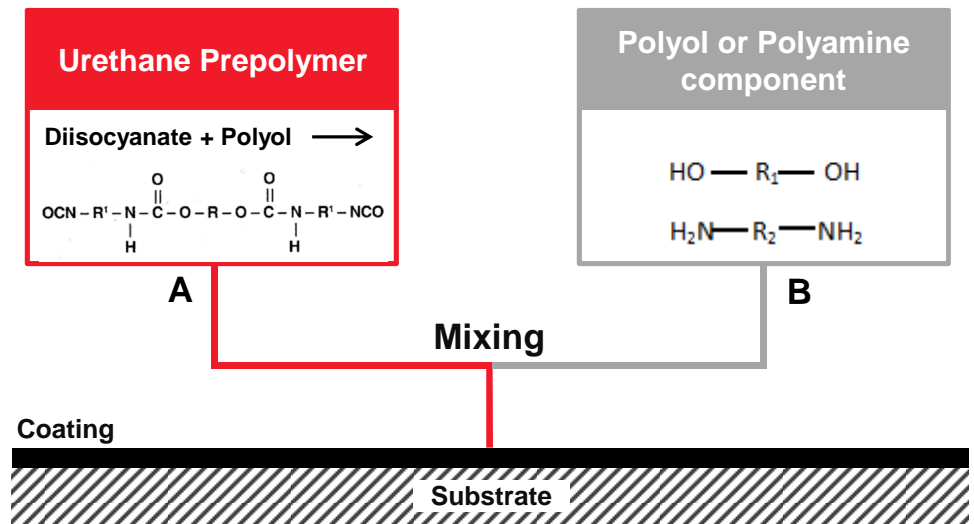
X Trixene[®]
Urethane Prepolymers

2K urethane coatings can have unique properties using urethane prepolymers as a building block

Crosslinker Approach for 2K Coatings



Prepolymer Approach for 2K Coatings



Benefits

- Hard domain affected by isocyanate ring
- Soft domain affected by the polyol
- Two dimensions (Polyol and Isocyanate)

Benefits

- Coating with elastomeric properties
- Higher degree of property adjustment
- Three dimensions (Polyol/Polyamine and Prepolymer)

Upcoming isocyanate restriction as well as OEMs push low residual diisocyanate products

ECHA's draft for the restricted use of free diisocyanates

- Products containing **residual diisocyanates above 0.1 wt%** will be restricted in industrial and professional applications
- They can be used only after **implementation of technical and organizational measures** as well as a minimum **standardized training of the user**
- **Exempted** are products
 - with **residual diisocyanate content <0.1 wt%** or
 - where a **very low potential risk** can be shown

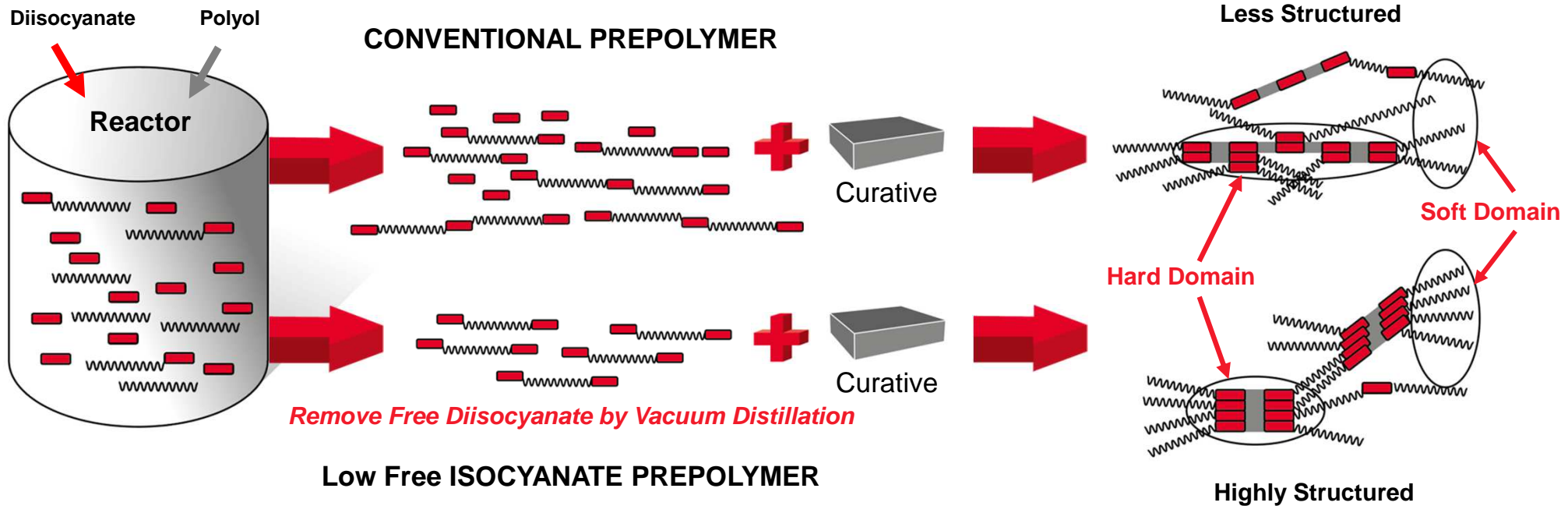


Using LANXESS' Low Free* (LF) urethane prepolymers would avoid impact of the restriction

*Low Free indicates prepolymers with low residual diisocyanate content <0.1wt%

Adiprene® and Trixene® Low Free (LF) isocyanate prepolymers contain <0.1% residual diisocyanate

Concept of Adiprene® Low Free (LF) isocyanate prepolymers



LANXESS high performance prepolymers for high-end coatings like erosion resistant solutions



LANXESS LF prepolymer systems

- LANXESS produce prepolymers used in coatings of wind energy or aerospace applications to protect the leading edge
- Focusing on low free (LF) isocyanate monomer technology (<0.1 wt%)
- Strong expertise in prepolymer formulation for customized solutions
- Improved industrial hygiene and reduced hazard classification whilst delivering excellent durability and weathering performance

Product highlights

- Adiprene® LFH C840 (**HDI**) used for turbine coating
- Adiprene® LW 520 and 570 (**H12MDI**) suitable for aerospace and wind energy
- Trixene® DP9A/997 LM (**IPDI**) for high performance top coats



LANXESS Urethane Systems is leading with technology and innovation



Adiprene® LF technology offers a solution to avoid impact of intended diisocyanate restriction



Adiprene® and Trixene® prepolymers can be tailored to customers needs



Going forward, Urethane Systems plans to supply all Adiprene® LF prepolymers <0.1% residual diisocyanate content

PU systems for every application

- **LF HDI & LF IPDI** – clear aliphatic prepolymers with good UV stability and weathering
- **H₁₂MDI** – for extreme erosion resistant coatings
- **LF pPDI** – extreme environments of heat, cold, and chemicals
- **LF MDI** – unmatched low levels <0.1% free isocyanate, excellent performance and easy processing
- **LF TDI** – strong performance in a wide range of applications