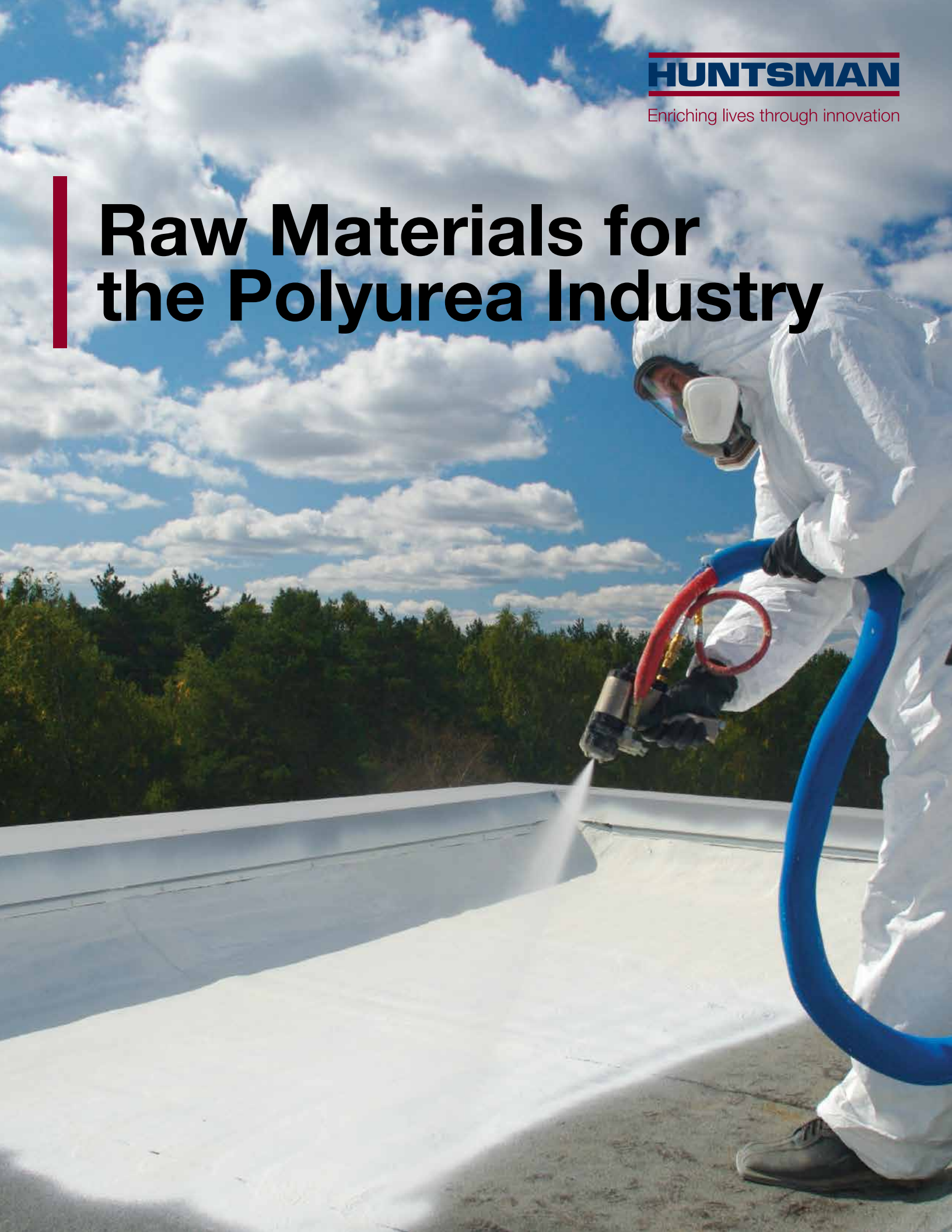
HUNTSMAN

Enriching lives through innovation

# Raw Materials for the Polyurea Industry



# Introduction

Huntsman is a major supplier of the key ingredients for polyurea technology and is continuously expanding its range to meet the most specific industry coatings needs. Polyurea systems are defined as the reaction of an isocyanate (A-component) with a resin blend (B-component) containing amines.

The Huntsman Performance Products division offers one of the broadest range of JEFFAMINE® polyetheramines and other specialty amines. These are key ingredients in the B-component, to create a wide range of formulation options to tailor-made the systems according to the end use requirements.

JEFFAMINE® polyetheramines and JEFFLINK® chain extenders are designed for use in combination with aromatic and aliphatic types of isocyanates.

Huntsman is one of the world's leading producers of diphenylmethane diisocyanate (MDI) - a core component in the creation of polyurea systems. The polyurethanes division offers a range of SUPRASEC® MDI grades to be used in polyurea applications, ensuring extremely good miscibility with the resin blends and therefore provide a constant reactivity profile.

# B-component

Amine-terminated resin blend

## JEFFAMINE® polyetheramines

**JEFFAMINE® polyetheramines** are an expanding family of Huntsman products. They consist of monoamines, diamines and triamines and contain primary amino groups attached to the end of a polyether backbone. The JEFFAMINE® polyetheramines undergo typical amine reactions, often imparting increased flexibility, toughness, low viscosity, and low colour. The primary amine groups in these molecules react rapidly and consistently with the isocyanate components, obviating the need for catalysts. The wide range of molecular weight, amine functionality, repeating unit type and distribution can provide flexibility in the design of new mixtures.

**JEFFAMINE® SD-secondary polyetheramine** is a high content, secondary aliphatic, liquid polyetherdiamine. The secondary amine functional groups provide a slower reaction compared to primary amines, capable of slowing down the cure speed of polyurea elastomeric coating systems. Designed to be used in conjunction with aromatic or aliphatic chain extenders, or partially replace existing primary polyetheramines, it can improve the flexibility of aromatic formulations. As low viscosity liquid, this secondary aliphatic diamine allows the efficient formation of much lower viscosity isocyanate prepolymers, with properties equivalent to primary polyetheramines or polyols used.

The **JEFFAMINE® THF polyetheramines** are tetramethylene ether glycol based. More hydrophobic in nature, these polyetheramines show a lower water absorption than the standard polyetheramines and significant improvement in abrasion resistance.

## JEFFLINK® chain extenders

**JEFFLINK® chain extenders** are cycloaliphatic bis (secondary amine) chain extenders for aromatic and light-stable polyurea coating systems where a slower reaction of amines is desirable.

## JEFFSOL® carbonates as diluents and cleaning solvents

Huntsman has developed a range of environmentally-friendly, biodegradable, high solvency p ower solvents, which can be efficiently used in the polyurea industry.

**JEFFSOL® PC propylene carbonate** acts as an excellent solvent for isocyanate (and polyols). It can be used both as a compatibiliser for systems, as a highly effective viscosity depressant, or as a cleaner solvent.

| B-COMPONENT: AMINE-TERMINATED RESIN BLEND | TYPICAL PROPERTIES | | | | | | APPLICATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Approximate molecular weight, g/mol | Typical total amine content, meq/g | Equivalent weight with isocyanate, g/eq | Density, g/ml @ 25°C | Viscosity @ 25°C | Flash Point, PMCC, °C | Aromaic polyurea spray coating | Aliphatic polyurea spray coating | Hard workable polyurea (repair, joints, sealants) | Isocyanate dispersions | Isocyanate prepolymer preparation |
| **POLYETHERAMINES** | | | | | | | | | | | |
| **Primary polyetheramines soft segments** | | | | | | | | | | | |
| **JEFFAMINE® D-400 amine**<br>Polyoxypropylene diamine | 430 | 4.1-4.7 | 230 | 0.972 | 22 | 163 | ■ | ■ | | | |
| **JEFFAMINE® D-2010 amine**<br>Polyoxypropylene diamine | 2000 | 0.90-1.05 | ~1030 | 0.991 | 248 | 185 | ■ | ■ | ■ | | ■ |
| **JEFFAMINE® D-3000 amine**<br>Polyoxypropylene triamine | 3000 | 0.90-0.98 | 1060 | 0.996 | 367 | 235 | ■ | ■ | ■ | | |
| **JEFFAMINE® D-5000 amine**<br>Polyoxypropylene triamine | 5000 | 0.50-0.54 | 1904 | 0.997 | 819 | 213 | ■ | ■ | ■ | | |
| **JEFFAMINE® THF-100 amine**<br>PTMEG/PPG copolymer based diamine | 1000 | 1.87-2.06 | 520 | 0.976 | 121 @ 40°C | 238 | ■ | ■ | | | |
| **JEFFAMINE® THF-170 amine**<br>Higher reactivity PTMEG based triamine | 1700 | 1.4-1.7 | ~760 | 0.965 @ 38°C | 936 @ 38°C | >232 | ■ | ■ | | | |
| **Primary polyetheramines soft segments** | | | | | | | | | | | |
| **JEFFAMINE® SD-2001 amine**<br>Secondary amine derivate of JEFFAMINE® D-2000 amine | 2050 | 0.875-1.03 | 1025 | 0.978 | 209 | 149 | ■ | ■ | ■ | | ■ |
| **CHAIN EXTENDERS** | | | | | | | | | | | |
| **Cycloalphatic amine chain extenders** | | | | | | | | | | | |
| **JEFFLINK® 136 diamine**<br>Cycloaliphatic bis (secondary amine), offering an extended gel time with short tack-free time | 276 | 6,95-7.3 | ~139 | 0.990 | 1000 | >100 | ■ | ■ | ■ | ■ | |
| **Aliphatic amine chain extenders** | | | | | | | | | | | |
| **JEFFAMINE® D-230 amine**<br>Polyoxypropylene diamine | 230 | 8.1-8.7 | 120 | 0.948 | 9.5 | 121 | ■ | ■ | | ■ | |
| **JEFFAMINE® T-403 amine**<br>Polyoxypropylene triamine | 440 | 6.1-6.6 | 162 | 0.978 | 72 | 196 | ■ | ■ | | ■ | |
| **DILUENT / VISCOSITY DEPRESSANT / CLEANING SOLVENT** | | | | | | | | | | | |
| **JEFFSOL® PC propylene carbonate**<br>Environmentally-friendly, biodegradable solvent system to reduce the viscosity and improve processing of polyurea formulations. Also suitable as cleaner solvent to remove liquid MDI and TDI (monomer, prepolymer) | | | | 1.2 | 2.1 | 135 | ■ | ■ | ■ | | |

# A-component

## Isocyanate

### SUPRASEC® MDI grades

The isocyanate component can be either aromatic (MDI-based) to produce conventional polyureas, or either aliphatic (IPDI, HDI, H12 MDI, TMXDI) to produce aliphatic, light-stable polyureas.

The Huntsman Polyurethanes division offers a wide range of SUPRASEC® MDI grades to be used in polyurea applications.

| A-COMPONENT: ISOCYANATE | TYPICAL PROPERTIES | | | | APPLICATION | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NCO content (%) | Density, g/ml @ 25°C | Viscosity @ 25°C (mPas) | Flash Point, PMCC, °C (closed open cup) | Aromaic polyurea spray coating | Aliphatic polyurea spray coating | Hard workable polyurea (repair, joints, sealants) | Isocyanate dispersions | Isocyanate prepolymer preparation |
| ISOCYANATE PREPOLYMERS | | | | | | | | | |
| **SUPRASEC® 2008 isocyanate**<br>Low functional MDI based prepolymer for high elastic polyurea coatings with a slower reactivity. Average functionality of 2.0 | 10.2% | 1.13 | 1800 | 227 | ■ | | ■ | | |
| **SUPRASEC® 2054 isocyanate**<br>Low functional MDI based prepolymer for standard high strength polyurea systems. Average functionality of 2.0 | 15.0% | 1.11 | 775 | 175 | ■ | | ■ | | |
| **SUPRASEC® 2067 isocyanate**<br>Higher functional MDI based prepolymer for hard polyurea systems. Average functionality of 2.2 | 19.3% | 1.14 | 610 | >100 | ■ | | | | |

## About Huntsman

Huntsman Corporation is a publicly traded global manufacturer and marketer of differentiated and specialty chemicals with 2020 revenues of approximately $6 billion. Our chemical products number in the thousands and are sold worldwide to manufacturers serving a broad and diverse range of consumer and industrial end markets. We operate more than 70 manufacturing, R&D and operations facilities in approximately 30 countries and employ approximately 9,000 associates within our four distinct business divisions. For more information about Huntsman, please visit the company's website at www.huntsman.com.

## Huntsman Performance Products

Performance Products brings together innovation and world-leading process technologies to produce components used to formulate products that enhance people's lives. Our leading global positions in the manufacture and sale of amines, maleic anhydride and carbonates enable us to serve diverse consumer and industrial end markets, including energy, automotive and transportation, coatings and adhesives, construction and infrastructure, electronics, and industrial manufacturing. With 10 manufacturing facilities in North America, Europe, the Middle East and Asia, we produce and sell over 350 products to over 900 global customers, and provide extensive pre- and post-sales technical service support. The division had 2020 revenues of USD 1 billion.

**www.huntsman.com/pp**

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