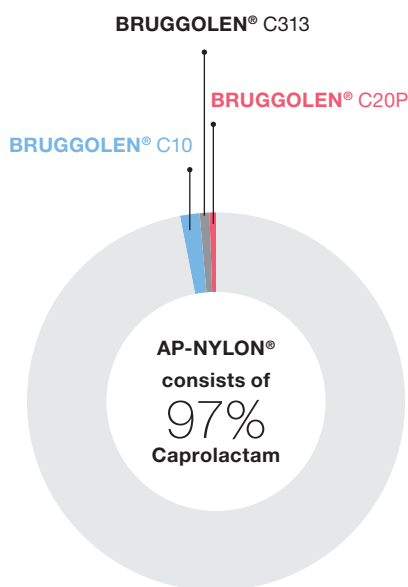


AP-NYLON® Additives

Creating the missing link.

AP-NYLON® Caprolactam

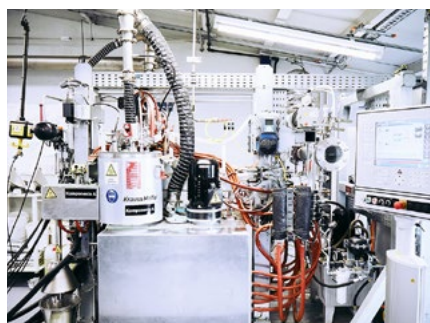
The Ideal Base for Cast Polyamides



Cast nylon is produced via the anionic polymerization of **AP-NYLON®** Caprolactam. The products of the polymerization exhibit outstanding material properties such as high impact strength, superior abrasion resistance and vibration damping, exceptionally low inherent stresses in a material with a high degree of crystallinity.

The casting process requires temperatures of 100 to 160°C and no pressure during molding. It is suitable for a variety of molding techniques - vertical and centrifugal casting, rotomolding - and also allows the production of parts with hollow geometries.

A highly efficient process requiring 2% or less of **BRUGGOLEN®** catalyst and activator to affect the polymerization, thus providing a highly cost effective system for moldings which are difficult to manufacture via other means.



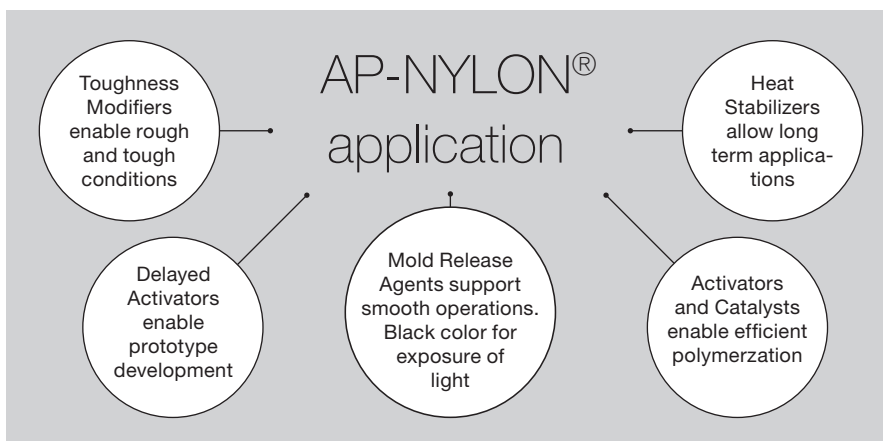
RTM-Line in our Application Lab

BRUGGOLEN® C Additives for AP-NYLON® Cast Polyamides

Brüggemann supplies a portfolio of additives such as catalysts, activators for prolonged open times and toughness enhancer to assist users in realizing a host of products - including advice for application developments.



Thermoplastic AP-NYLON® Composites



Additives for the Activator Side

Solid Activators for AP-NYLON®		Dosage*	Packaging
BRUGGOLEN® C20P	standard activator	0.5 to 1.5%	70 kg plastic drums
BRUGGOLEN® C25	extends open time before solidification	0.5 to 1.5%	25 kg cardboard box

Liquid Activator for AP-NYLON®			
BRUGGOLEN® C235	N-Ethylpyrrolidon-free activator	0.5 to 1.5%	60 kg steel drum

Polymeric Activators for NYRIM®			
NYRIM® P1-30 Prepolymer	viscous elastomeric activator	15 to 44%	25 kg steel drum
NYRIM® P1-20A Prepolymer	viscous elastomeric activator for low dosage	11 to 22%	25 kg steel drum
BRUGGOLEN® TP-C1312	viscous elastomeric activator	4 to 40%	25 kg steel drum

BRUGGOLEN® Stabilizers and Colors			
BRUGGOLEN® C313	stabilizer for temperatures up to 120°C	0.3%	25 kg cardboard box
BRUGGOLEN® TP-C1608	stabilizer for temperatures up to 150°C	0.3%	25 kg cardboard box
BRUGGOLEN® C403	black dye	< 0.1%	15 kg cardboard box
BRUGGOLEN® C407	blue dye	0.05%	1.5 kg steel can
BRUGGOLEN® TP-C1704	light stabilizer	0.5%	25 kg cardboard box
BRUGGOLEN® TP-C1973	anti-bubble	1.0%	20 kg cardboard box

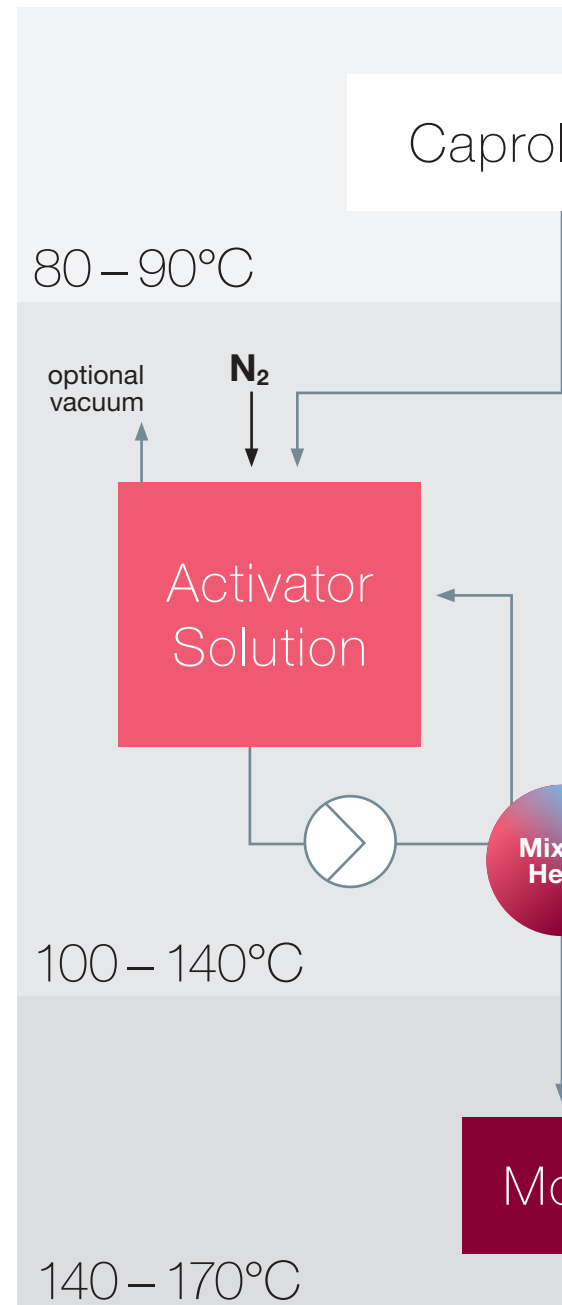
NYRIM® Additives			
NYRIM® Mold Release B	release agent	0.2 to 0.5%	25 kg cardboard box
NYRIM® Foam Stabilizer	reduces macroscopic shrink of molding	0.3%	5 kg steel container
NYRIM® Additive 6 Plus	improves toughness	2 to 5%	25 kg steel drum

*dosage percentage based on total casting weight

Caprolactam

The Monomer for AP-NYLON®	
AP-NYLON® Caprolactam Flakes	solid monomer for anionic polymerization
Caprolactam Liquid (AP-Quality)	molten monomer for anionic polymerization

*dosage percentage based on total casting weight



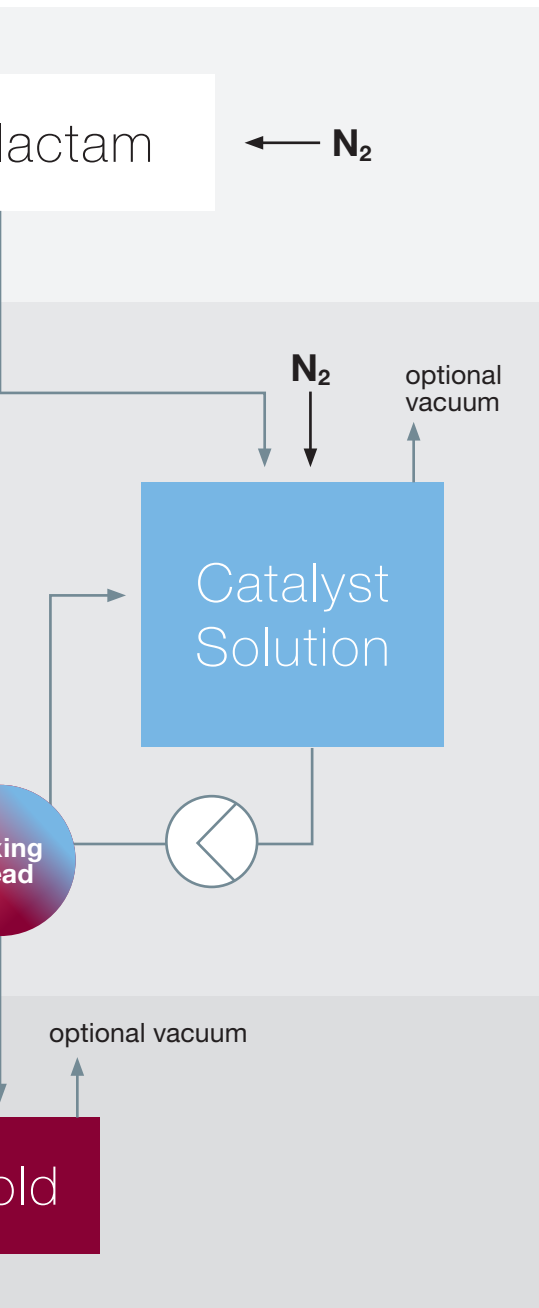
Mold Release

External Mold-Release for NYRIM® and AP-NYLON®	
NYRIM® Mold Sealer	reduces sticking to the mold

*dosage percentage based on total casting weight

Additives for the Catalyst Side

	Dosage*	Packaging
on	98 to 56%	25 kg metalized plastic bags / 1250 kg per palette
on	98 to 56%	full-truck-loads ca. 25t



Catalyst for AP-NYLON®		Dosage*	Packaging
BRUGGOLEN® C10	solid sodium based catalyst	0.8 to 2.2%	20 kg plastic bag 50 kg plastic drum

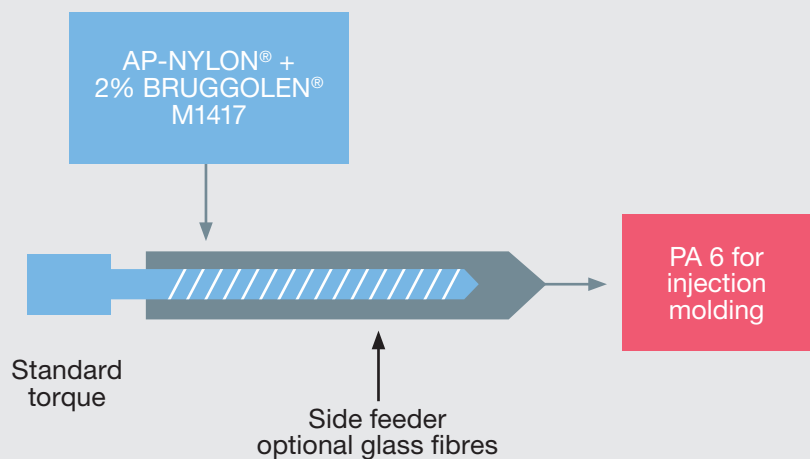
Catalyst for NYRIM®			
NYRIM® C1 Catalyst	solid magnesium based catalyst	4 to 8%	40 kg plastic drum

Toughness Modifier for AP-NYLON® for the Catalyst Side			
BRUGGOLEN® C540	viscous elastomer	1.5 to 25%	200 kg steel drum

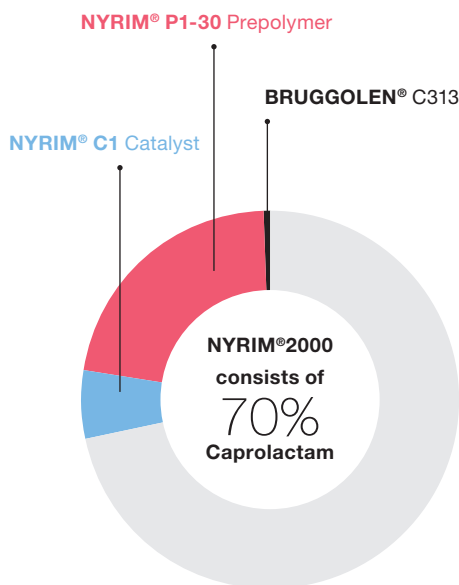
*dosage percentage based on total casting weight

Recycling of Regrinds and Shavings of AP-NYLON®

- **Up-cycle high-viscosity polyamide waste into prime injection molding quality**
- Added value: 100% waste convertible in one extrusion step
- On-target: Dosage allows to tailor target viscosity
- Robust: High mechanical performance even at high dosage
- Efficient without addition of virgin PA
- Recycled quality applicable for all injection molding processes



	Dosage*	Packaging
	Once per shift	5 l steel container



NYRIM® Impact Resistance Down to the Extreme Cold

NYRIM® is a thermoplastic material noted for its exceptionally high shape stability over a temperature range of -40 to 140°C. It distinguishes itself by its outstanding impact strength and impact resistance and thus lends itself to “rough and tough” applications not accessible to other materials.

The unique nature of **NYRIM®** is due to the incorporation of elastomers into its Polyamide 6 backbone. The level of elastomer determines the characteristics of this copolymer and is adjusted by the elastomeric activator during the polymerization reaction - a 10% level from **NYRIM®1000** up to 40% from **NYRIM®4000**.



NYRIM® for Rough and Tough Applications

	AP-NYLON®	NYRIM®		
		1000	2000	4000
Impact resistance (Izod) at 23°C [kJ/m²]	4	10	30	no fracture
Impact resistance (Izod) at -40°C [kJ/m²]	2	7	9	no fracture
Elongation at fracture [%]	6	40	270	420
Hardness (Shore D) [-]	85	79	74	59
Modulus of elasticity (tensile test) [MPa]	3500	2500	1700	500
Tensile strength [MPa]	80	58	47	26

Brüggemann Your “One-Stop” Supplier

Brüggemann provides all the necessary base materials for the production of **AP-NYLON®** and **NYRIM®** parts as well as for composites and pultruded profiles that are based on fully recyclable thermoplastic **AP-NYLON®**.

As a leading global supplier of these specialty products, we are your “one-stop” source, backed up by our in-house R&D and advanced application laboratories in Heilbronn. Our team of experts can support and assist you with any new application, providing advice and trial services all the way through to the production stage, whatever production processes (casting, RIM, RTM, rotomolding, pultrusion, filament winding ...) is applied.

In order to support your developments we can also supply dedicated small scale samples.



AP-NYLON® Nature and Colored
BRUGGOLEN® C407 (Blue)
BRUGGOLEN® C403 (Black)

Contacts

L. Brüggemann GmbH & Co. KG

Salzstrasse 131
74076 Heilbronn, Germany
Telephone +49 7131 1575-0
Fax +49 7131 1575 25 111
info@brueggemann.com

BruggemannChemical U.S., Inc.

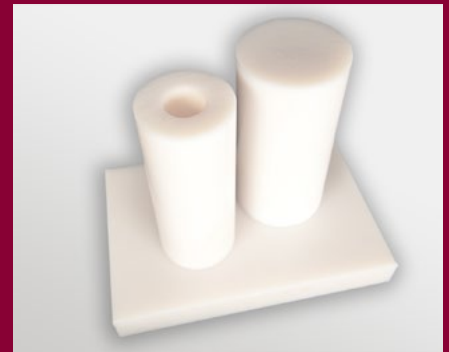
18 Campus Blvd, Ste. 100
Newtown Square,
PA 19073, USA
Telephone +1 610 353 9852
Fax +1 610 353 9853
usa@brueggemann.com

BrueggemannChemical Asia Ltd.

Room 1705, 17/F
625 King's Road
North Point, Island East, Hong Kong
Telephone +852 3460 2527
Fax +852 3460 2522
asia@brueggemann.com



AP-NYLON® Gears



Semi-finished Goods: Plates and Rods

www.brueggemann.com

Disclaimer of representations and warranties: Limitation of Liabilities

L. Brüggemann GmbH & Co. KG., BruggemannChemical U.S., Inc., BrueggemannChemical Asia Ltd. and their affiliated companies (collectively, the "Bruggemann Group") make no representations or warranties of merchantability or of fitness for any particular purpose or use, and make no other express or implied representations or warranties with respect to the Bruggemann Group products described herein, including, but not limited to, any information provided by any company of the Bruggemann Group, whether orally or in writing, as to the chemical and physical characteristics of such products.

The information contained herein – and any other related information provided, orally or in writing, by any company of the Bruggemann Group is provided to the best of the Bruggemann Group's knowledge. The information contained herein is of a general nature and is for informational purposes only. Product specifications must in each case be expressly agreed upon in writing or may be provided by the respective company of the Bruggemann Group in a separate document which must be expressly related to a particular purchase order. Each buyer or user is responsible for conducting its own tests to determine the chemical and physical characteristics of a Bruggemann Group product or its suitability for an intended purpose or use.

In no event shall any company of the Bruggemann Group be liable to any buyer or user of the Bruggemann Group products for any loss or damages, direct or indirect, of any kind or nature (including general, special, incidental, consequential, liquidated, or punitive damages or any damages calculated by reference to loss of anticipated revenues or profits, or loss of use of products, costs of replacement products, or additional expenses incurred in the use of products), or for any other damages to the property or person of any buyer or user, in each case which may arise as a result of the use or application of the Bruggemann Group products described herein or the information provided by any company of the Bruggemann Group, negligently or otherwise, or the infringement of any patent, trademark or other intellectual property rights.

Each buyer and user of a Bruggemann Group product shall obtain and review the applicable material safety information before handling any of the Bruggemann Group products.

All of the provisions of the General Terms and Conditions of Sale and Delivery of any company of the Bruggemann Group, as amended from time to time, including, but not limited to, those relating to the extent and limitations of the liability of the respective company of the Bruggemann Group, will apply to all sales of the Bruggemann Group products and are incorporated by reference herein.