REVOLUTIONARY PACKAGING: RECYCLABILITY & PERFORMANCE

UBE NYLON benefits /

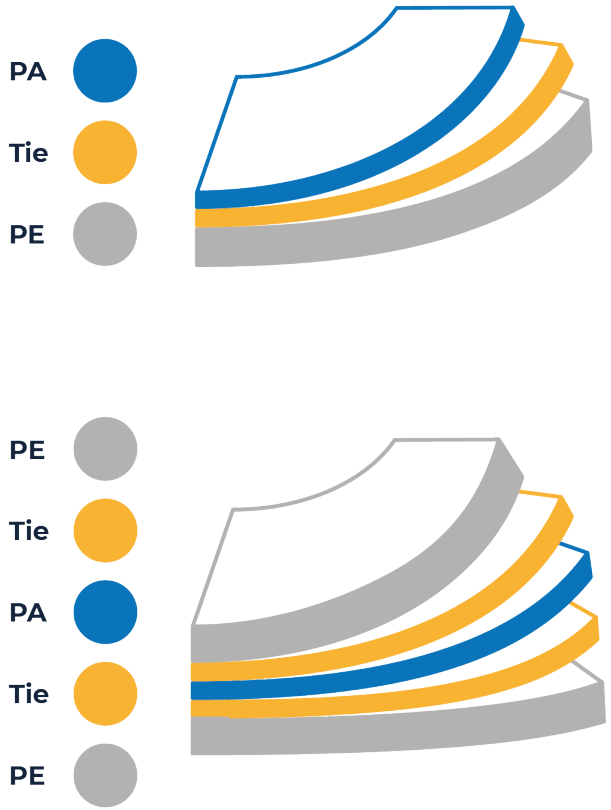
Performance packaging containing UBE NYLON is the solution to reduce food waste.

Smart flexible packaging materials are customized to meet product protection specifications and provide safety, quality and convenience.

- LESS CO_2 EMISSIONS
- LIGHTER WEIGHT
- LONGER SHELF-LIFE
- EXPORTS FARTHER
- EXCELLENT PUNCTURE RESISTANCE
- IMPROVED THERMAL RESISTANCE
- SAFE HANDLING
- RECYCLABLE

STANDARD FILMS
IN THE MARKET

- Most common structures are **coextruded** with **PE** where PE is the main polymer.
- Between PA and PE layer there is always a **Tie layer**.
- Tie layer is a **PE grafted with MAH** which fixes the structure and compatibilizers polymers.



CoPA6/6.6 IS SUITABLE FOR RECYCLING WITHIN THE PE-FLEXIBLES STREAM

Association of Plastic Recyclers
2050 M Street NW
Washington, DC 20036

www.plasticsrecycling.org

The Association of Plastic Recyclers
Meets Critical Guidance

January 17, 2022

Mr. Bruno De Bièvre
UBE CORPORATION EUROPE S.A.U
Polígono Industrial El Serrallo, s/n
12100 Castellón (Spain)
Dear Mr. De Bièvre,

APR, the Association of Plastic Recyclers, is pleased to recognize UBE Corporation's PE-based multilayer film with enhanced mechanical and barrier properties conferred by a PA6/6.6 inner layer and the presence of PE-based tie layers grafted with maleic anhydride (MAH), as meeting or exceeding the most strict APR PE-CG-01 Critical Guidance Protocol for PE Film and Flexible Packaging criteria. This APR recognition is based on the technical recyclability of the film innovation, in the polyethylene film recycling stream.

A Review Committee, appointed per the APR Recognition Operating Procedures, reviewed your data submission and concluded the data were correctly obtained by a qualified laboratory and were completely presented to show the coated films submitted meet or exceed the most challenging test conditions and strictest APR Critical Guidance criteria.

The PE Film Critical Guidance documents that were used to evaluate the film innovation, are the product of a multi-industry consensus process to identify and address certain key technical considerations related to the recycling of postconsumer PE films. The Documents direct innovators to conduct specific testing per established testing procedures and then provide the innovator with guidance to interpret the results. The protocols are intended to help improve the quality of the recycled PE film stream by aiding innovators to make informed decisions about the consequences of packaging innovations. APR thanks UBE for voluntarily submitting this film structure for Recognition. The impact of these protocols is beneficial to world-wide recycling efforts. Meeting the Critical Guidance Document is a truly significant step in demonstrating overall recyclability of your film innovation.

Our recognition applies only to the PE-based multilayer film with enhanced mechanical and barrier properties conferred by a PA6/6.6 inner layer and the presence of PE-based tie layers grafted with maleic anhydride (MAH). While this Recognition speaks to the compatibility of your innovation film, with PE film recycling, it does not speak to collection of films or include other films in the market that may conflict with the PE film recycling process. We encourage UBE Corporation to be sure in its packaging information that the public does not misunderstand that this Recognition applies to other barrier coatings or to believe collection is happening when it is not.

Yours truly,

President and CEO

The Voice of Plastics Recycling®

RecyClass

c/o Plastics Recyclers Europe
Avenue de Broqueville 12
1150 Brussels, Brussels

Phone: +32 2 315 24 60
info@recyclass.eu
www.recyclass.eu

UBE

RECYCLASS TECHNOLOGY APPROVAL

Brussels, 23 March 2021

DISCLAIMER

RecyClass recognition applies only to UBE 'PERFORMANCE PA SC15' technology reported in Annex I. It, therefore, does not concern to a recyclability assessment of specific packaging using this film. Any specific packaging using this film would need to be tested individually to demonstrate that the system of resin, adjuvants, label, closure, and printing conforms to the RecyClass Recyclability Evaluation Protocol for PE films, and that it is sorted in the PE flexible stream at the state -of-art sorting plants in Europe.
Publication of results of testing of this technology MUST clearly include all the conditions listed in the approval letter. Partial reporting of the conditions is forbidden.
Additionally, any change in the formulation of the technology must be communicated to the Technical Committee which will reassess the approval of the technology.

The RecyClass PO films Technical Committee was requested to carry out an assessment of the technology 'PERFORMANCE PA SC15' by UBE to verify its impact on the quality of recycled PE flexible packaging.

The technology is a LDPE-based multilayer film with barrier properties conferred by a polyamide inner layer. The PA 6/6.6 copolymer (UBE NYLON 5034B) composing the structure at 15%wt is characterized by a low melting point and a low stiffness. Its compatibility is ensured by 10%wt LLDPE-based tie layers grafted with maleic anhydride (MAH). The film has been tested unprinted.

According to the results that were obtained from the laboratory test by Aimplas, carried out as per the Recyclability Evaluation Protocol for PE films, the 'PERFORMANCE PA SC15' technology is considered to be limited compatible with PE flexibles recycling.

Based on these results, RecyClass certifies that UBE 'PERFORMANCE PA SC15' technology have limited negative impact on the current European PE flexibles recycling provided that PE flexible films based on this technology are designed only under the following conditions:

a) The density of the PE film is below 0,97 g/cm^3;

CERTIFICATE

Recyclability of a Packaging Material Group

BASF SE
Carl-Bosch-Strasse 38
67056 Ludwigshafen am Rhein, Germany

The company receives the certification of recyclability for the following packaging materials.

Designation

Co-Polyamide (PA6/6.6)
made from PA6 and PA6.6 monomers with melting points < 200°C
as layer in in coextruded polyethylene films, based on LDPE and/or LLDPE;
in combination with ≥ 0.5 g per g PA of maleic anhydride-grafted PE as tie layer specified for PA/PE, tested with ≤ 5% by weight of PA6 in a PCR LDPE recyclate

Test result

Assessment via path:	**Path 1: Plastic films / LDPE**
Recyclate (final product):	**LDPE Regranulate**

Test standard / scope of application:
☒ Requirements and assessment catalogue of the institute cyclos-HTP for EU-wide certification (state 14/09/2021) / Scope of validity according to nation states, see chapter 1
☒ DIN EN 13430 with regard to material recyclability in the post-use phase; also integrated

The following reference processes, materials and applications are taken into consideration within the certification process:
- Detection as flexible PE packaging in state-of-the-art sorting plants
- Recyclate use for injection moulding and blown film applications
- Test program based on CHI test protocol **CHI-C8-PEF-1/2.0** with the use of PCR-based LDPE recyclate as reference

According to the CHI standard the plastic material is no contaminant in the tested application and in the above-mentioned material combination and can be considered as:

Recycling Compatible for PE Film Recycling
(AT, BE, DE, ES, FR, IT, NL, NO, PT)

This certificate (No. 2187-2021-002630) is valid until the **30/11/2022** (1 year upon issue) for the countries listed in brackets above. This certificate will lose validity in case of qualitative or quantitative changes of packaging components.

Aachen, dated 23/11/2021

Dr. Roland Bothor
Publicly appointed and sworn expert for the IHK for packaging waste disposal
Competent authority: IHK Aachen

The certificate is only valid in conjunction with the 33 following pages of the test report No. 2187-006-2021.

Institute cyclos - HTP
Institute cyclos-HTP GmbH
Maria-Theresia-Allee 35 - 52064 Aachen
phone: +49 (0) 241 / 949 00 - 0
fax: +49 (0) 241 / 949 00 - 49

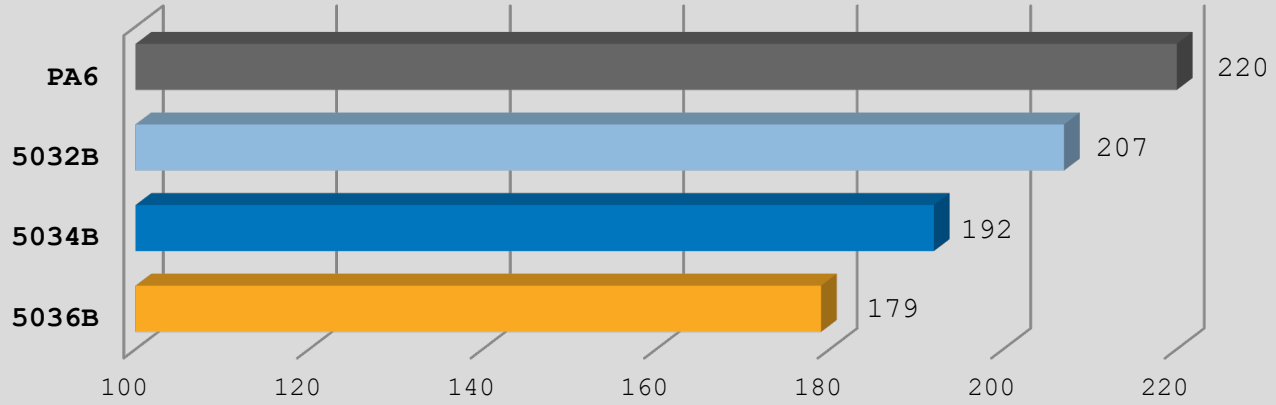
Stiftung Zentrale Stelle VERPACKUNGSREGISTER

Film and LDPE	Fibre-based labels if the cellulose share cannot be removed by means of cold washing; PA layers (excluding nylon 6 or co-polyamide 6-66 in coextruded PE/PA films without EVOH, combined with MAH-grafted PE as an adhesive promoter at a ratio of at least 0.5 g of adhesive per 1 g of PA); PE-X components; PVDC layers; other non-PE polymeric layers (excluding adhesion promoters, adhesives, PP, EVA and EVOH), non-polymeric layers (excluding SiOx/AlOx/metallisations).

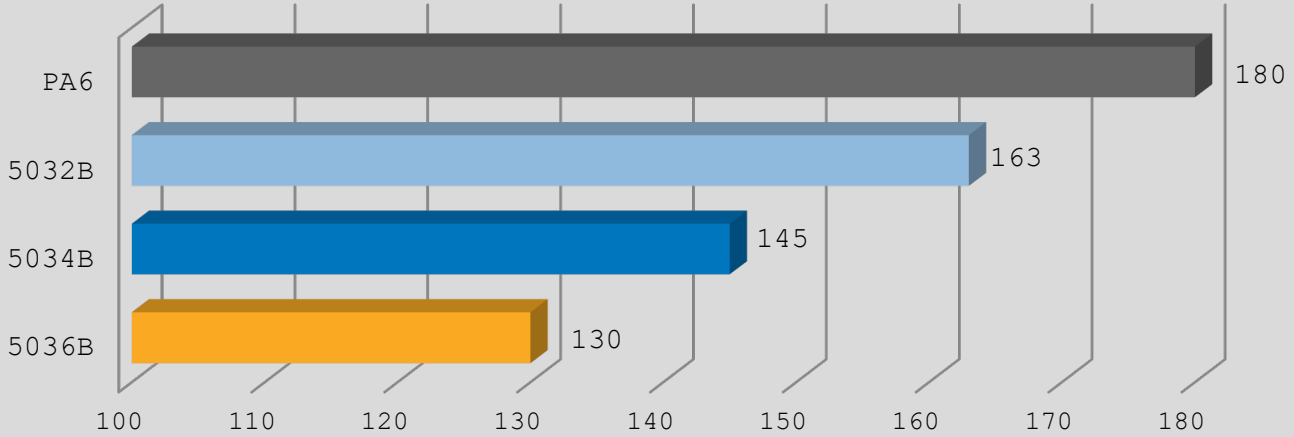
* For more detailed information, please visit the web side of each institution.

THERMAL PROPERTIES

Melting Temperature (°C)

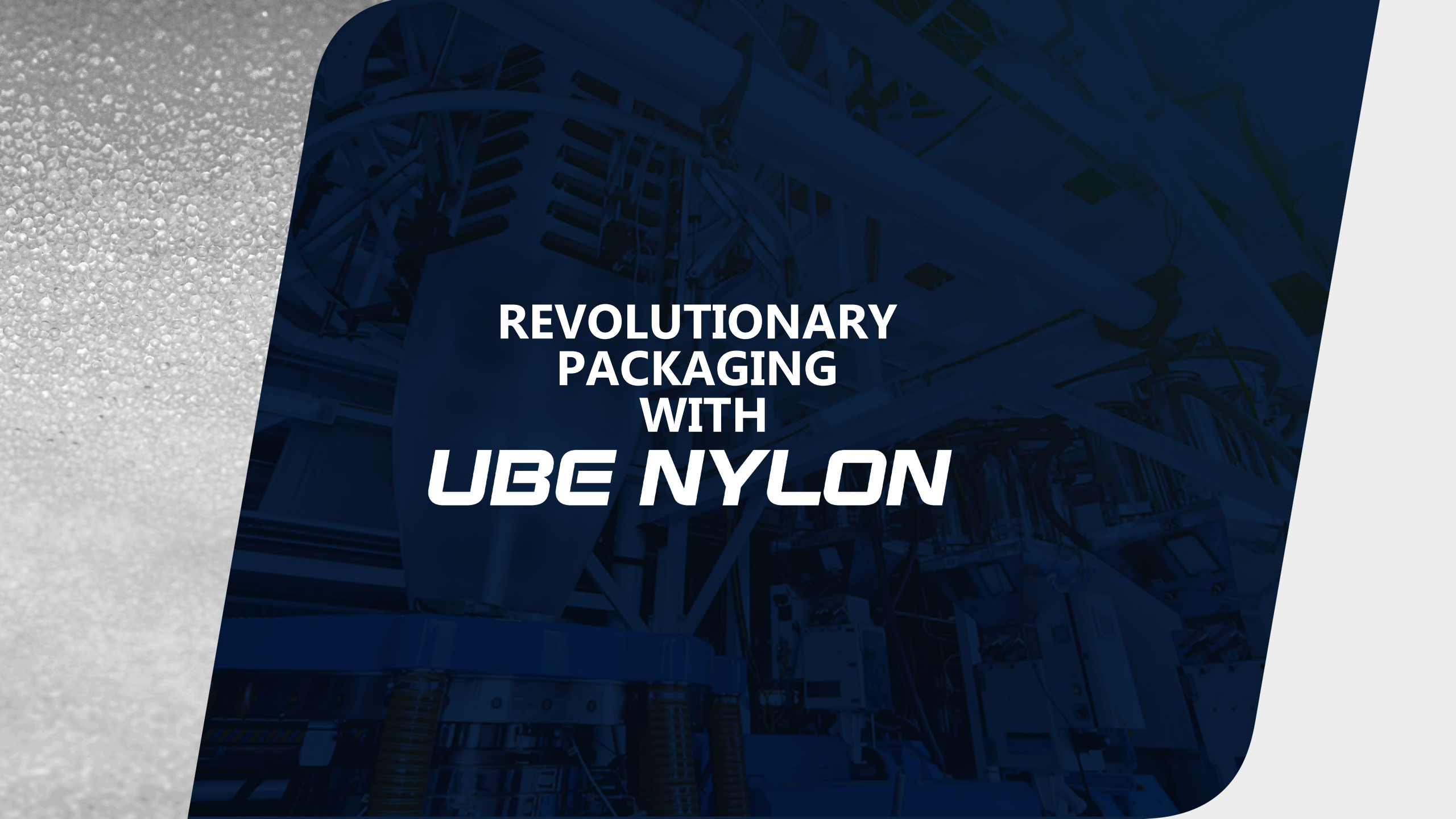


Crystallization Temperature (°C)



PA6

5036B


REVOLUTIONARY
PACKAGING
WITH
UBE NYLON