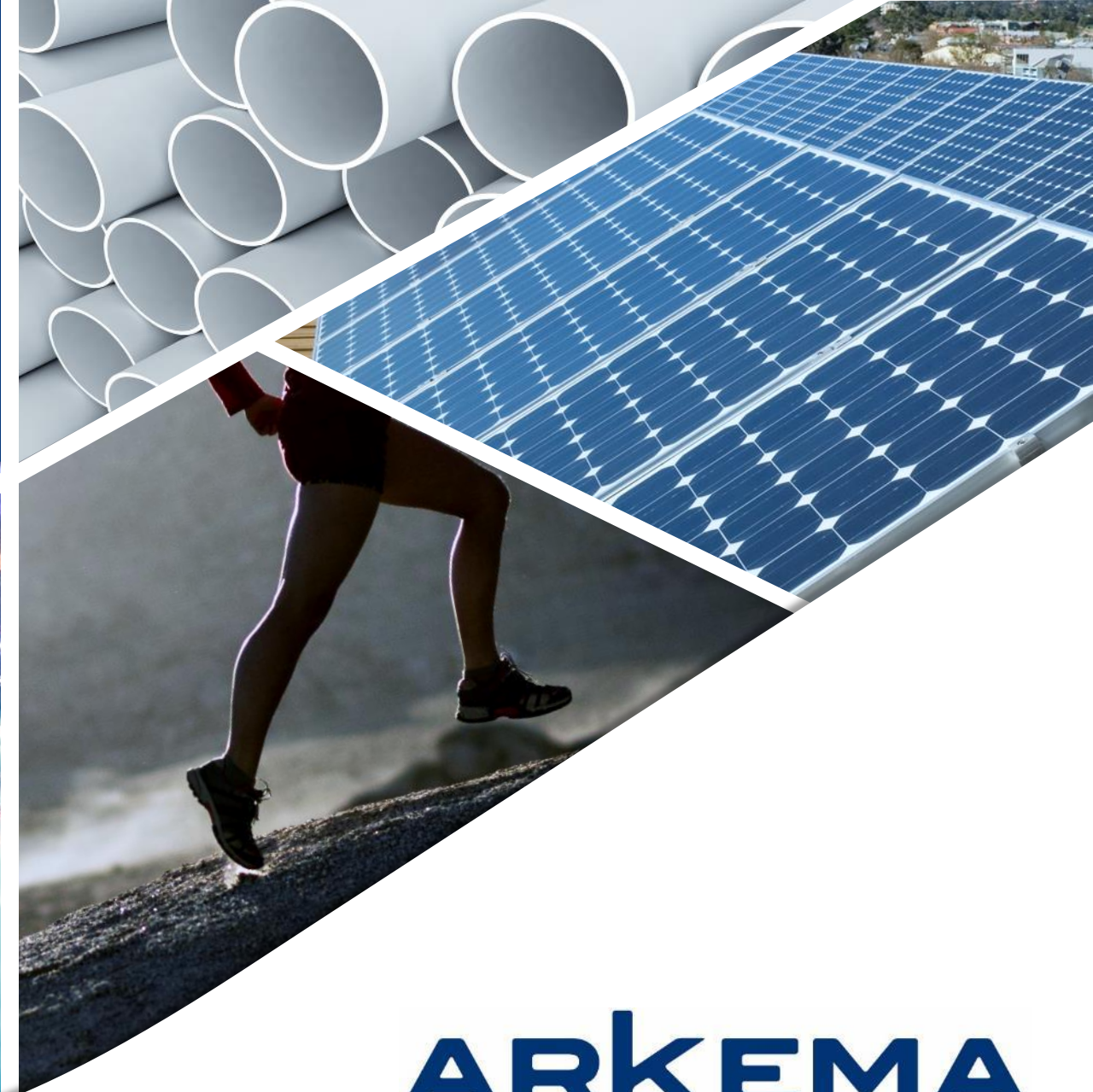


**High Performance Polymer For
Sustainable Green Solutions**
高性能聚合物材料在可持续绿色解决方案
中的应用

Michael ZHU
Technical Polymers
ARKEMA China



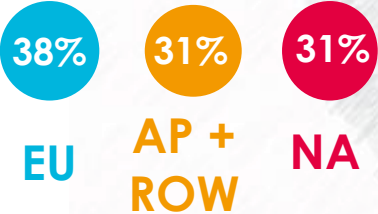
ARKEMA
INNOVATIVE CHEMISTRY

Arkema Snapshot 2018 basis



€8.8 billion

sales

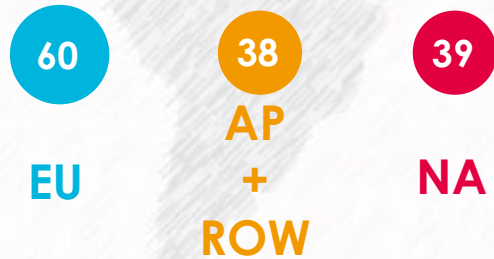


20,060
employees



A global presence in
55 countries

136 production
plants



~3% of sales
allocated to R&D

3 R&D and innovation
hubs

Spread over
13 R&D centers

1,600 researchers



3 major segments:

**High Performance
Materials**

Industrial Specialties

Coatings Solutions

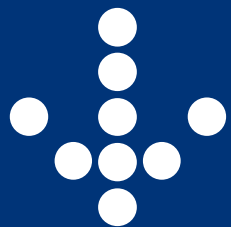
Deliver Sustainable Solutions Driven By Innovation

Our 6 Major Innovation Platform Aligned With The UN SDG

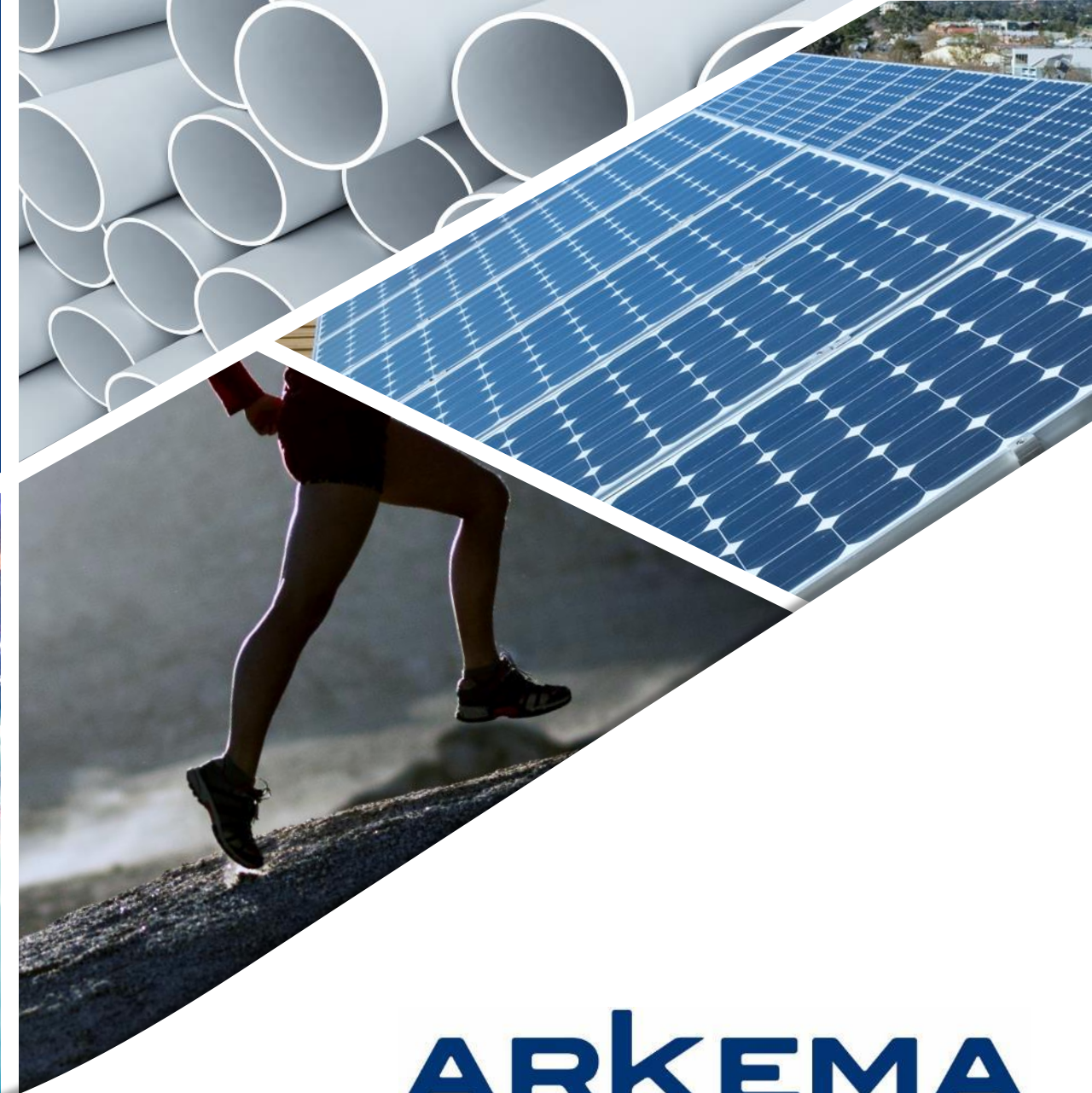
60% of patents filed in 2018 fall in the scope of these SDG



TECHNICAL POLYMERS



High Performance Polymer for
Sustainable Green Solutions
(高性能聚合物材料在可持续绿色
解决方案中的应用)



ARKEMA
INNOVATIVE CHEMISTRY

A Leading Global Supplier of Specialty Polymers



KYNAR[®]
BY ARKEMA

Polyvinylidene Fluoride (PVDF) resins and copolymers designed for extreme inertness in harsh environments, flame & smoke properties, durability and ease of processing

PEBAX[®]
BY ARKEMA

Thermoplastic elastomers (TPE) designed for unmatched combination of light weight, energy return, and ease of processing
(optionally bio-based)

RILSAN[®]
BY ARKEMA

High performance polyamide resins, coatings and additives that deliver toughness, flexibility and chemical resistance
(bio-based)

KEPSTAN[®]
BY ARKEMA

Ultra High performance polymers (PEKK) Lightweight, strong and resistant to (almost) everything

Polymer Range Positioning



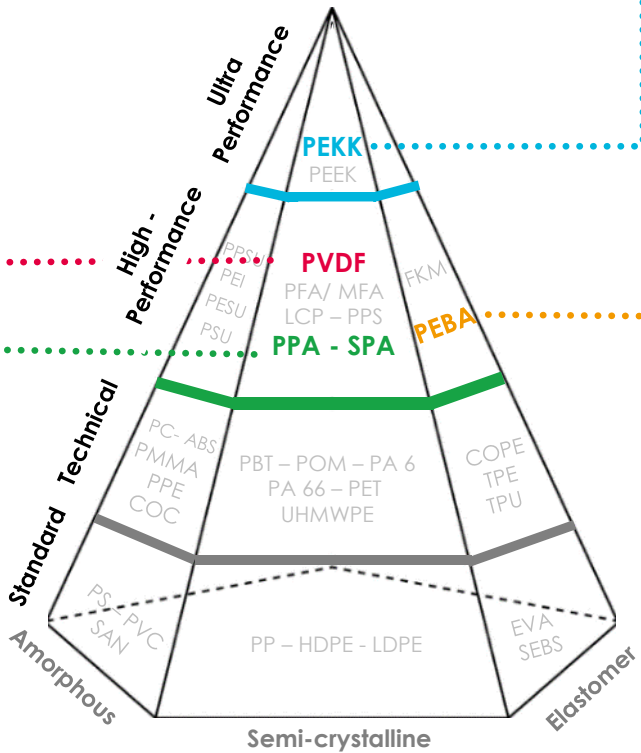
High Performance Fluoropolymers

- Key properties: Extreme Resistance, Durable and Easy to process
- Markets: Oil & Gas, CPI, Coating, Li-ion Battery, Wire & Cable



High Performance Bio-based Specialty Polyamides

- Key properties: Lightweight, Tough, Fatigue resistant
- Markets: Oil & Gas, Transportation, Sports



Ultra High Performance Poly-ketones

- Key properties: High Temperature Performance and High Strength
- Main Markets: Oil & Gas, Aerospace, 3D Printing



High Performance Elastomers

- Key properties: Toughness & Flexibility, Lightness, Energy return
- Markets: Sports, Consumer electronics, Medical, Industrial

IT'S AN EXTREME WORLD™ 挑战世界的极限



THE WORLD'S
TALLEST BUILDING
WILL SOON BE
MORE THAN 1
MILE HIGH
(1.6km)



THE NUMBER OF
CARS ON THE
ROAD WILL
DOUBLE IN THE
NEXT FEW
DECADES TO 2
BILLION



WORLD RECORDS
FROM THE LAST
GENERATION NO
LONGER QUALIFY
ATHLETES FOR
TODAY'S
OLYMPICS



80% OF THE
WORLD'S
OFFSHORE
RESERVES ARE
MORE THAN 4
MILES (6km)
UNDERWATER



UN Global Compact Roadmap For 2030 Horizon

SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY 	2 ZERO HUNGER 	3 GOOD HEALTH AND WELL-BEING 	4 QUALITY EDUCATION 	5 GENDER EQUALITY 	6 CLEAN WATER AND SANITATION 
7 AFFORDABLE AND CLEAN ENERGY 	8 DECENT WORK AND ECONOMIC GROWTH 	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 	10 REDUCED INEQUALITIES 	11 SUSTAINABLE CITIES AND COMMUNITIES 	12 RESPONSIBLE CONSUMPTION AND PRODUCTION 
13 CLIMATE ACTION 	14 LIFE BELOW WATER 	15 LIFE ON LAND 	16 PEACE, JUSTICE AND STRONG INSTITUTIONS 	17 PARTNERSHIPS FOR THE GOALS 	SUSTAINABLE DEVELOPMENT GOALS 

The Key SDGs For Technical Polymers

6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



17 PARTNERSHIPS FOR THE GOALS



A SUSTAINABLE STORY

可持续的故事



BIOMASS FROM PLANTS ~1YR CROP CYCLE



FOSSIL RESOURCE FROM BIOMASS ~1M YEARS

CASTOR BEAN IS AN INEDIBLE CROP

NO DEFORESTATION – GROWS IN ARID AREAS

NON-GMO

ARKEMA IS A MEMBER OF SUSTAINABLE CASTOR INITIATIVE

<0.5% of world's plastic is biobased

A Unique & Integrated Bio-based Supply Chain



CASTOR PLANT

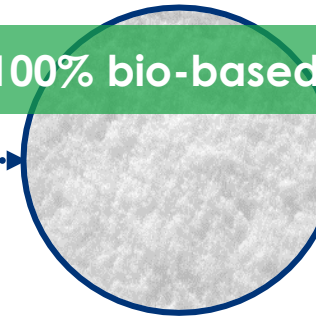


CASTOR SEEDS



CASTOR OIL

100% bio-based



AMINO 11



POLYMERIZATION

- No Food Competition
- From Semi-arid to sub-tropical
- Sustainable Farming
- From Annual to Short Cycle Crop Rotation
- Non GMO

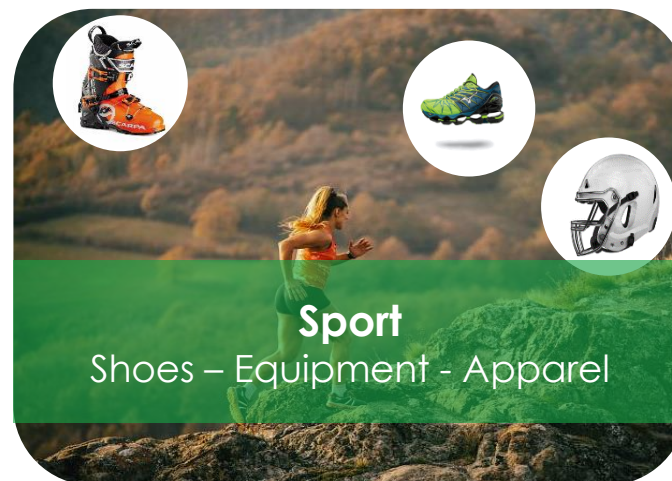


- Rilsan® PA11, Rilsan® Fine Powders **PA 11**
- Pebax® Rnew® **PEBA**
- Rilsan® HT **PPA**
- Rilsan® Clear **α-PA**
- Platamid® Rnew® **CoPA**

The Polyamide 11 Chain: Sustainable Markets & Applications



“ A proven legacy – An exciting future ”

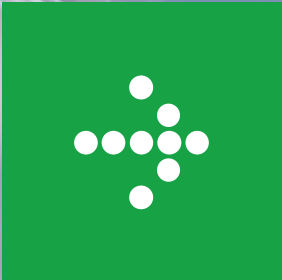


SUSTAINABILITY IS EVERYWHERE 可持续无处不在

SUATAINABLE GREEN SOLUTIONS



BIO-BASED
SPECIALTY
POLYAMIDES
FAMILY

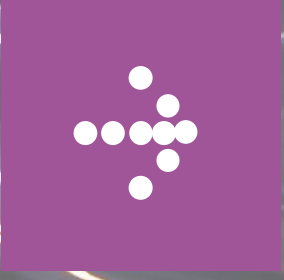


SOLUTIONS FOR
ALTERNATIVE
FUEL SYSTEMS
(LNG, CNG, H₂)



HIGH
PERFORMANCE
POWDER
COATING

KYNAR PVDF
POLYMER FOR
GREEN
SOLUTIONS



Water-Base
DURABLE
COATING



PHOTOVOLTAIC
PANEL
PROTECTION



WATER
TREATMENT
MEMBRANE

LI ION BATTERY
FOR EV/HEV

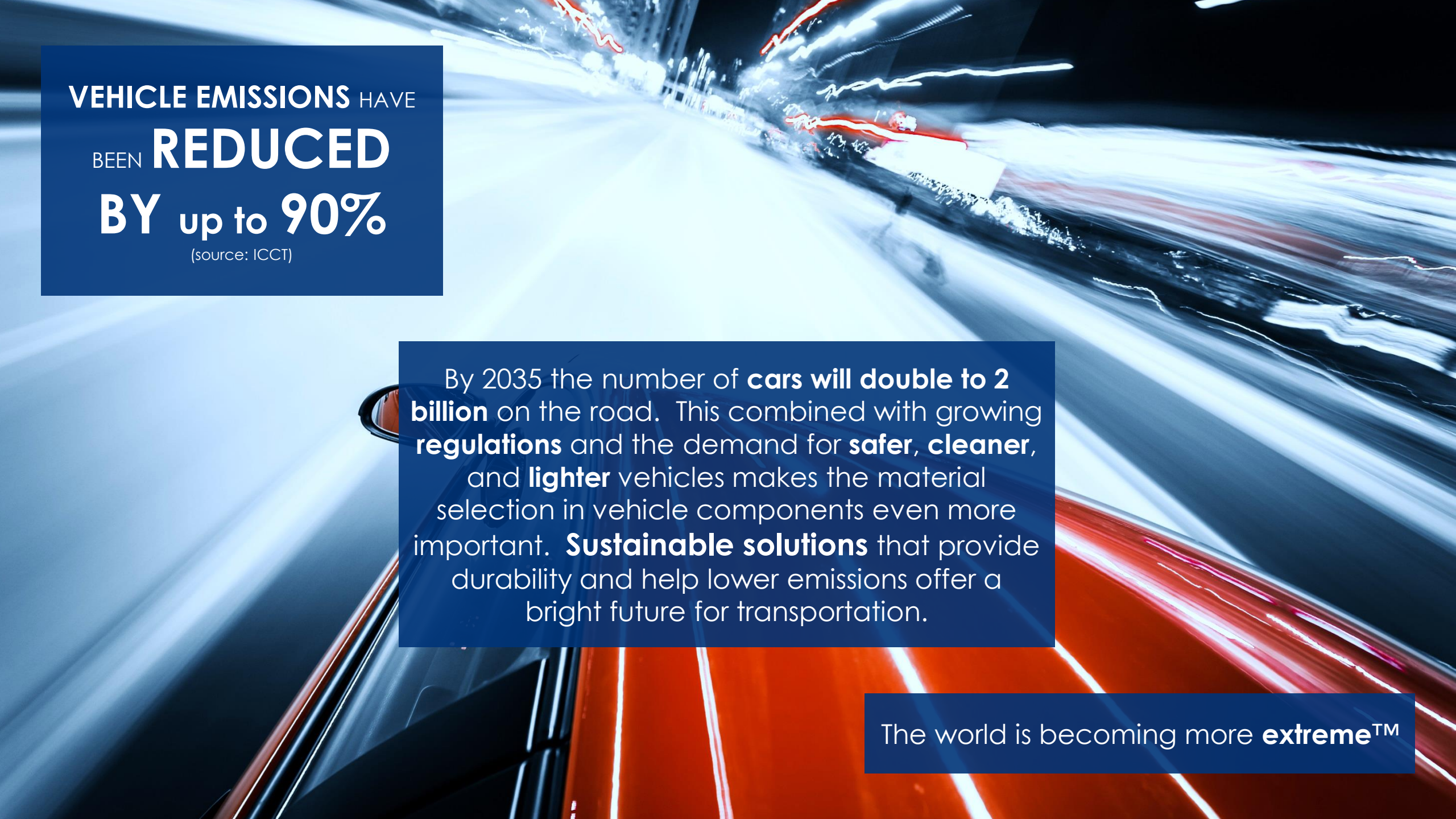
TRANSPORTATION

聚焦汽车

TECHNICAL POLYMERS
SOLUTIONS



ARKEMA
INNOVATIVE CHEMISTRY



VEHICLE EMISSIONS HAVE
BEEN **REDUCED**
BY up to **90%**

(source: ICCT)

By 2035 the number of **cars will double to 2 billion** on the road. This combined with growing **regulations** and the demand for **safer, cleaner,** and **lighter** vehicles makes the material selection in vehicle components even more important. **Sustainable solutions** that provide durability and help lower emissions offer a bright future for transportation.

The world is becoming more **extreme™**

AUTOMOTIVE APPLICATIONS 汽车领域的应用

Powertrain

FUEL, FLUID
MANAGEMENT

EMISSION
CONTROL
SYSTEMS

ALTERNATIVE
FUEL SYSTEMS
(LNG, CNG, H2)

CONNECTORS,
FITTINGS,
COMPONENTS

CHASSIS PARTS
(METAL
COATING)

Interior & Exterior

INTERIOR,
EXTERIOR PARTS
(AIR BAGS,
TEXTILE
ADHESIVES,
ANTISTATICS)

Electrical & Electronics

ELECTRICAL,
ELECTRONIC
COMPONENTS
(LI ION
BATTERIES,
CABLES)



BATTERY SOLUTIONS WITH KYNAR® PVDF

聚焦锂离子电池

LITHIUM-ION
FOCUS



ARKEMA
INNOVATIVE CHEMISTRY

BY 2025, THE WORLD
WILL MANUFACTURE

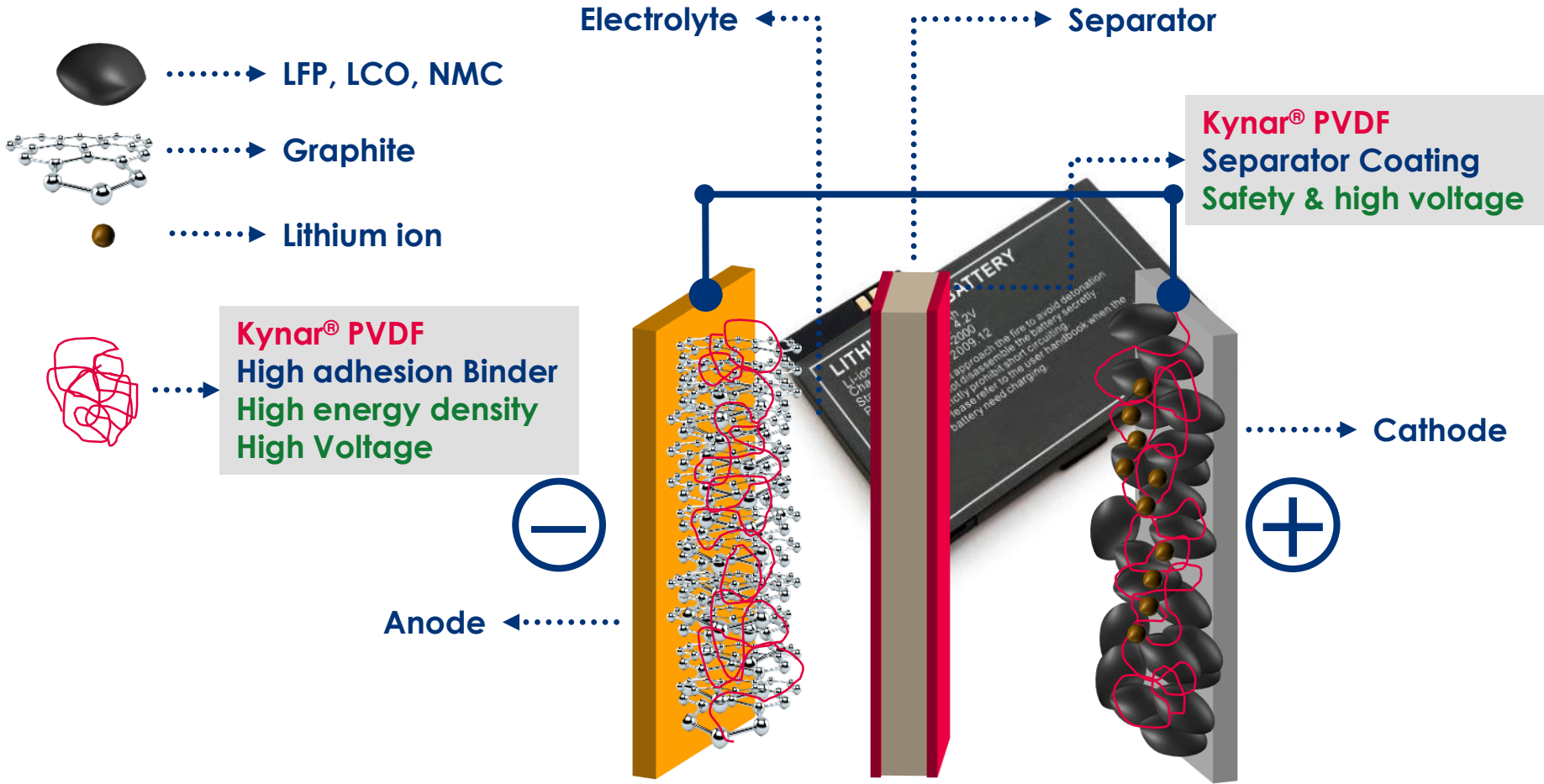
8 BILLION
LI-ION CELLS

Continued market growth requires rapid advances in higher energy density, higher performance at elevated temperatures, improved binder adhesion, easier processing, safety, and reductions in VOC emissions



The world is becoming more **extreme™**

WHERE IS KYNAR® PVDF USED IN LIB? 应用场景



WATER SOLUTIONS WITH KYNAR® PVDF

聚焦水处理膜

WATER FILTRATION
FOCUS

ARKEMA
INNOVATIVE CHEMISTRY

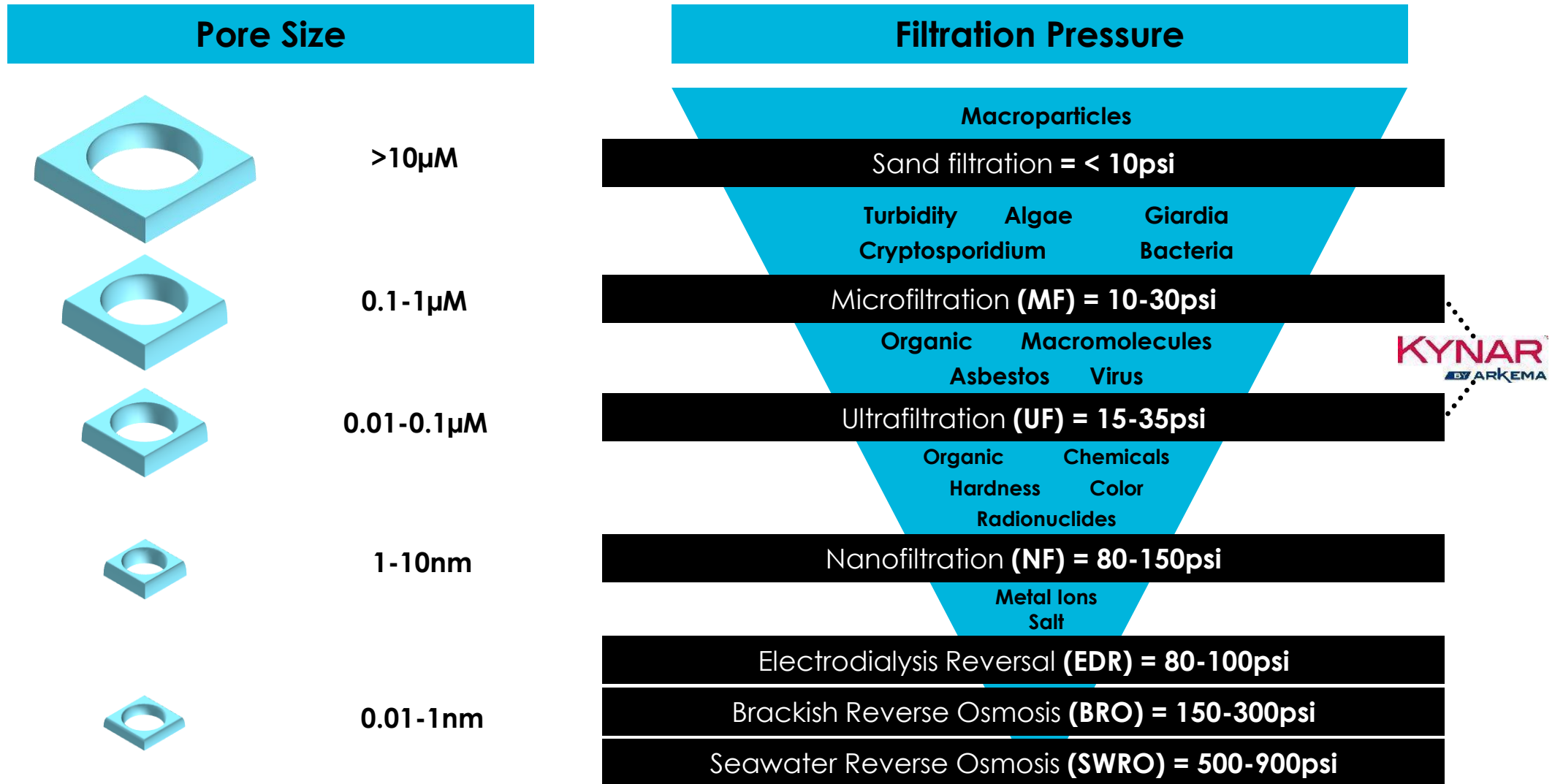
A young child with a shaved head, wearing a red shirt, is looking upwards with a hopeful expression. Water is spraying from a tap above, creating a dynamic background. The child's face is partially obscured by a black text box in the center.

NEARLY
1 BILLION PEOPLE
DO **NOT** HAVE ACCESS TO
CLEAN DRINKING WATER

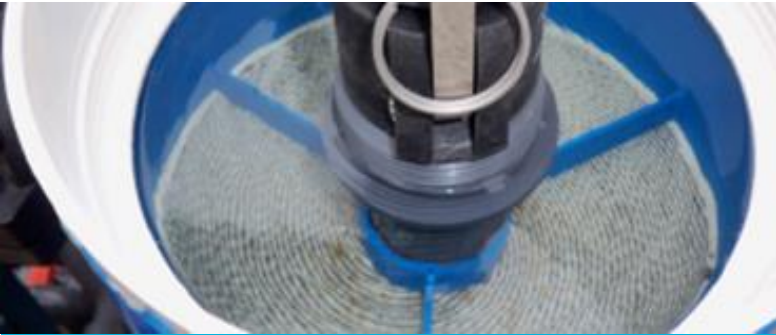
Our world depends on water. The fact that over 10% of the population does not have access to clean water creates a huge need for innovative solutions in the water filtration market. The success of these developments is highly dependent on material innovations.

The world is becoming more **extreme™**

CLASSIFICATIONS OF MEMBRANES 膜的过滤等级



KYNAR® PVDF FOR FILTRATION MEMBRANE



NIPS – FLAT SHEET



NIPS – HOLLOW FIBER



TIPS – HOLLOW FIBER

KYNAR®
BY ARKEMA