

# **TORAY Carbon Fibers**

## **MARINCOMP Symposium**

**September 1<sup>st</sup>, 2017**

**Toray Carbon Fibers Europe S.A.**

# Corporate Profile

- Company Name: Toray Industries, Inc.
- Founded : January 1926
- Capital Stock : 148 billion Yen
- Number of Subsidiaries & Affiliates : 255  
(Japanese 99, Overseas 156)
- Employees : Toray 7,220  
Consolidated basis 46,248







(as of March 31, 2017)



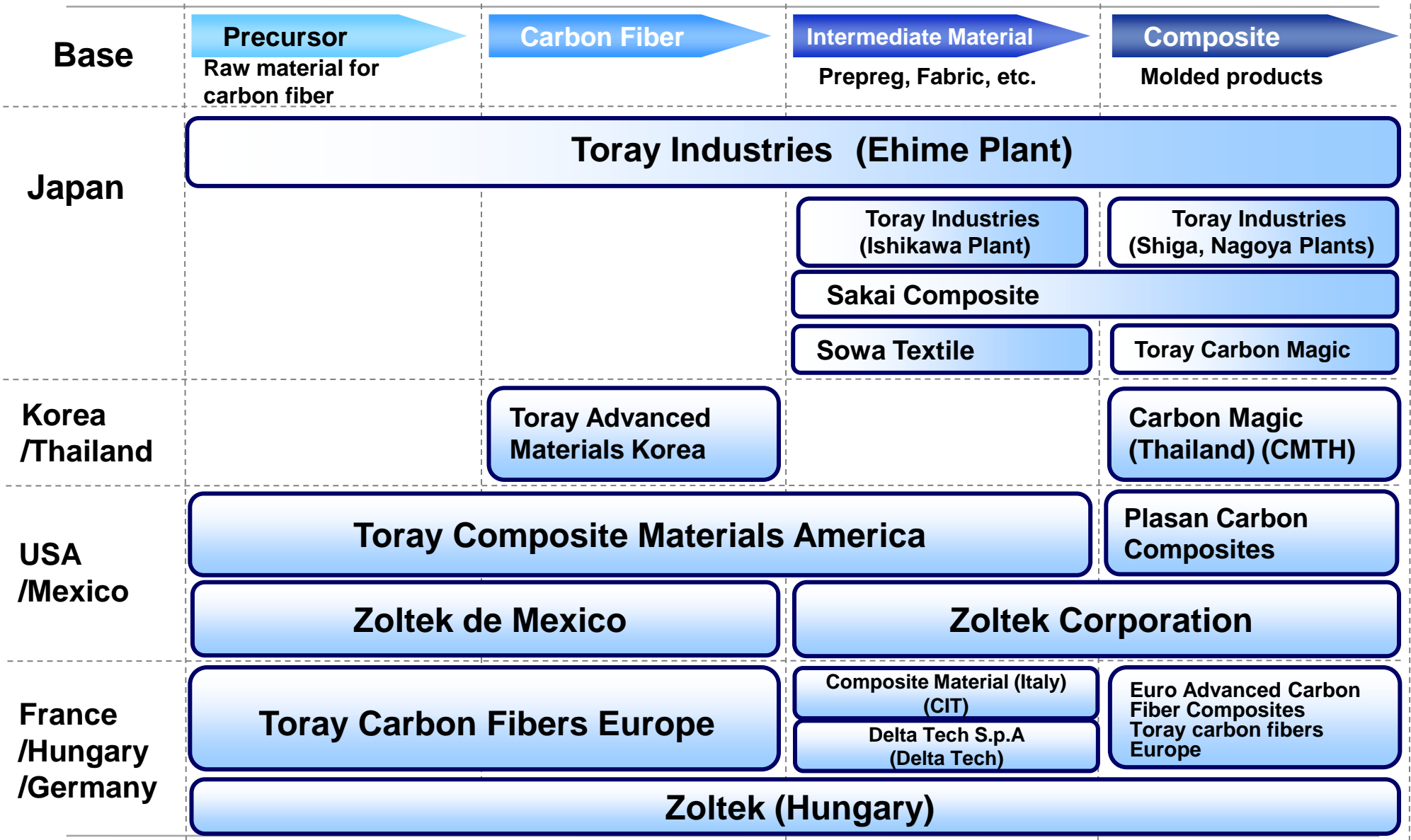
President  
Akihiro Nikkaku

# Sales and Operating Income by Business Category and Segment

<\* 119JPY/EUR>

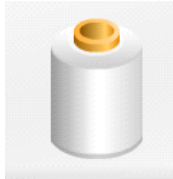
<Segments>	<Major Products>	Net Sales (FY 2016)
Foundation Businesses	Fibers and Textiles 	7,194 (42%)
	Plastics & Chemicals 	4,194 (25%)
Strategically Expanding Businesses	IT-related Products 	2,138 (13%)
	Carbon Fiber Composite Materials 	1,358 (8%)
	Environment & Engineering 	1,564 (9%)
Intensively Developing and Expanding Businesses	Life Science 	455 (3%)
	Others	126 (1%)
<b>Total</b>		<b>17,029</b> Million EUR

# Toray Group Production Bases



# Carbon fiber Manufacturing Process

## Raw Material

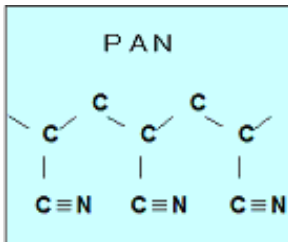


PAN

60% Carbon

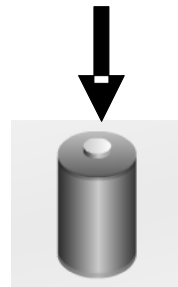
PAN quality strongly affects the CF quality

- Number of filament is controlled  
 ↳ No split of PAN yarn
- Each CF grade is made from a specific PAN grade

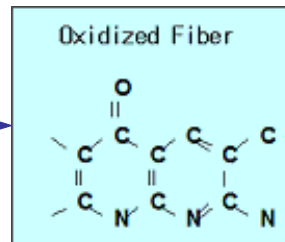


## STEP 1

Oxydation  
~200/300°C

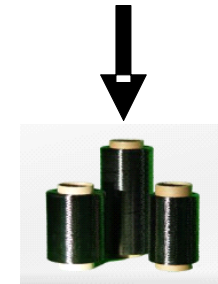


Oxydised PAN



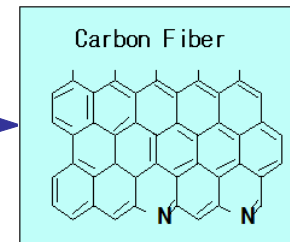
## STEP 2

Carbonisation  
~1000/2000°C



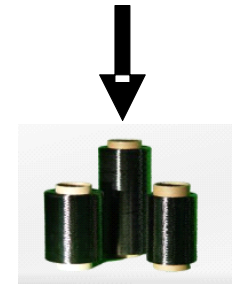
High strength CF

92% Carbon



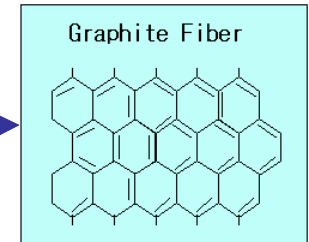
## STEP 3

Graphitisation  
~ 2000/3000°C



High Modulus CF

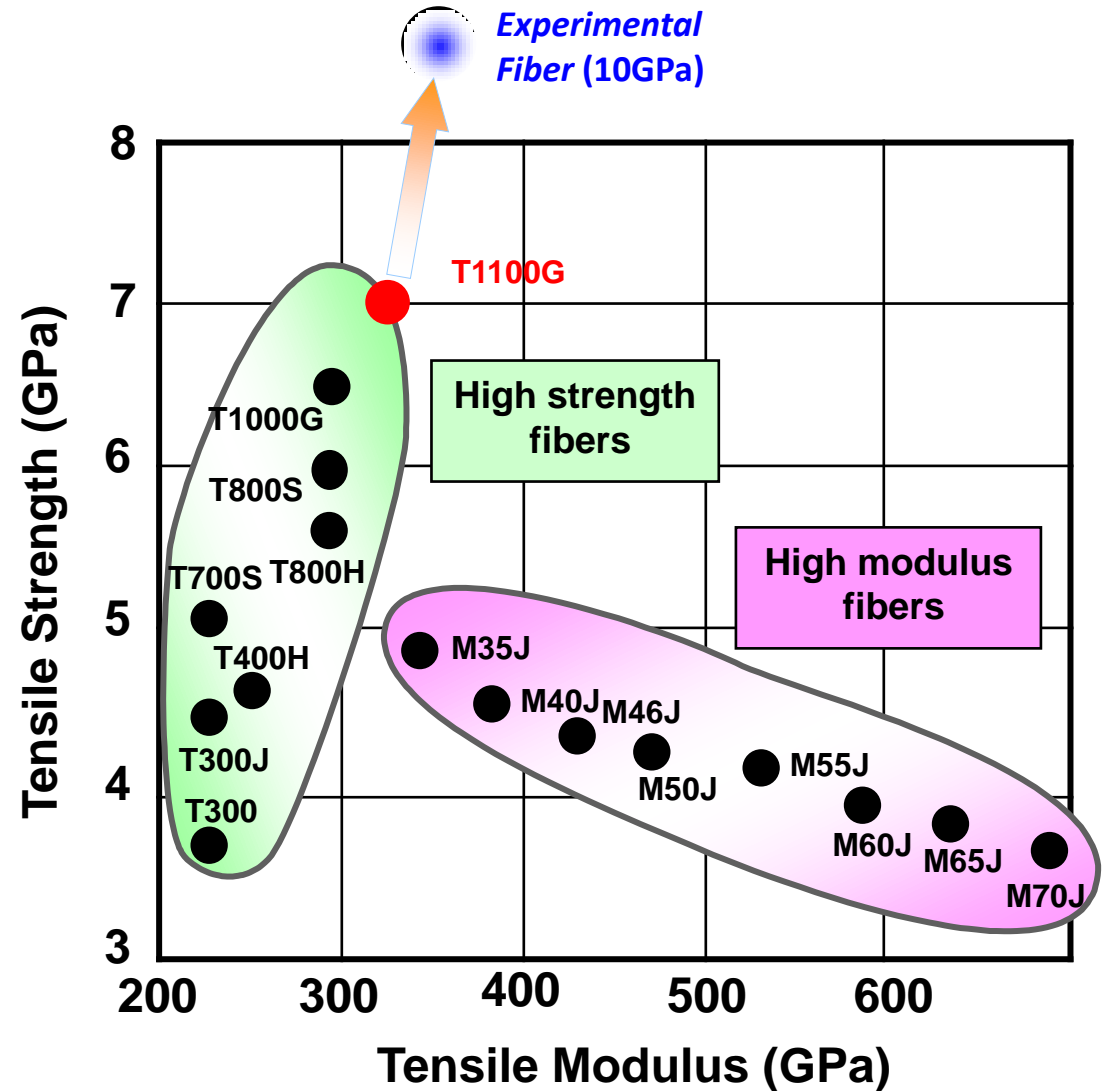
99% Carbon



Oxydation, carbonisation and graphitisation qualities are important to reach high and stable properties

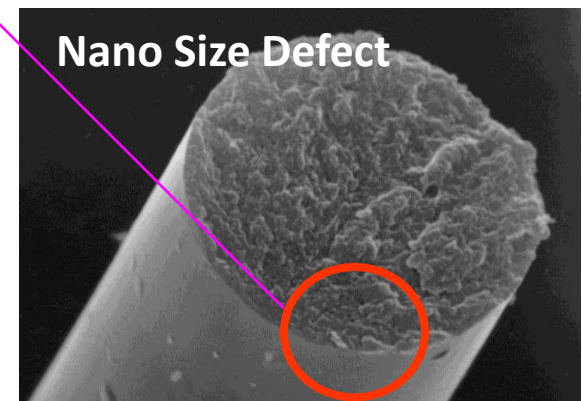
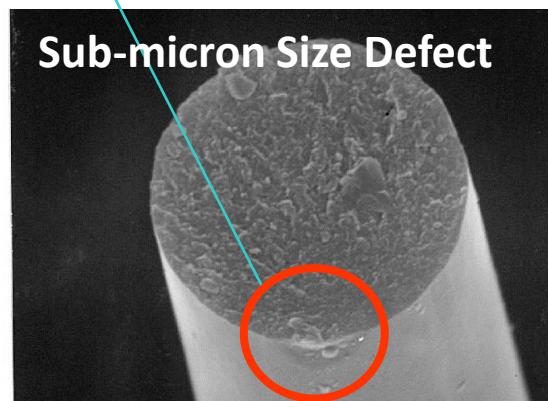
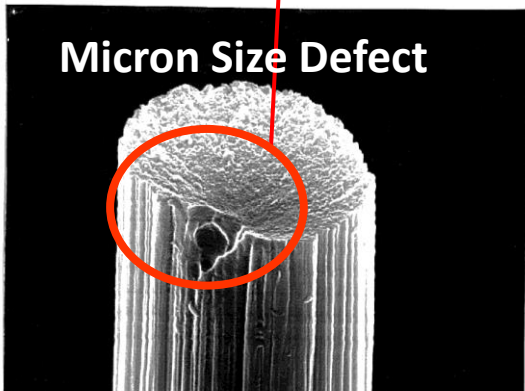
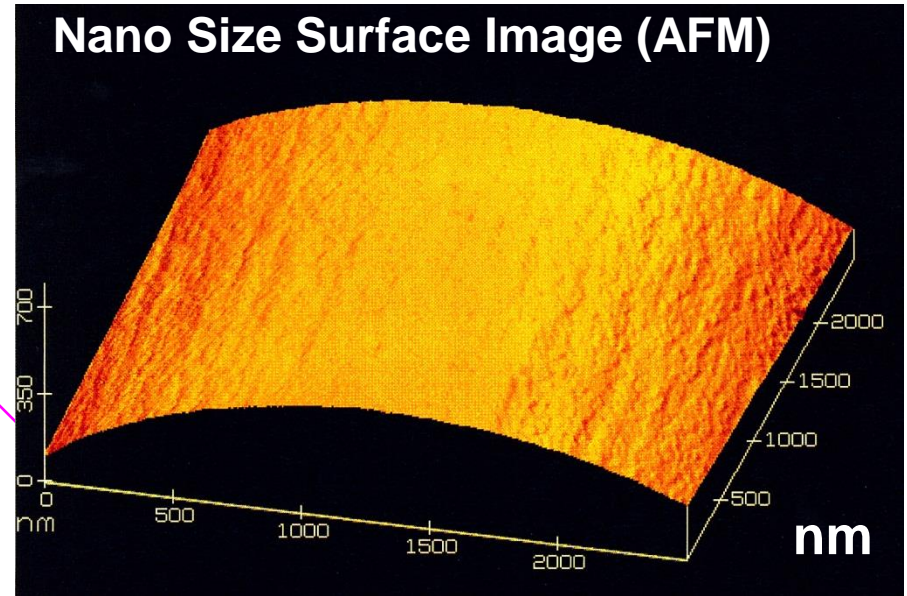
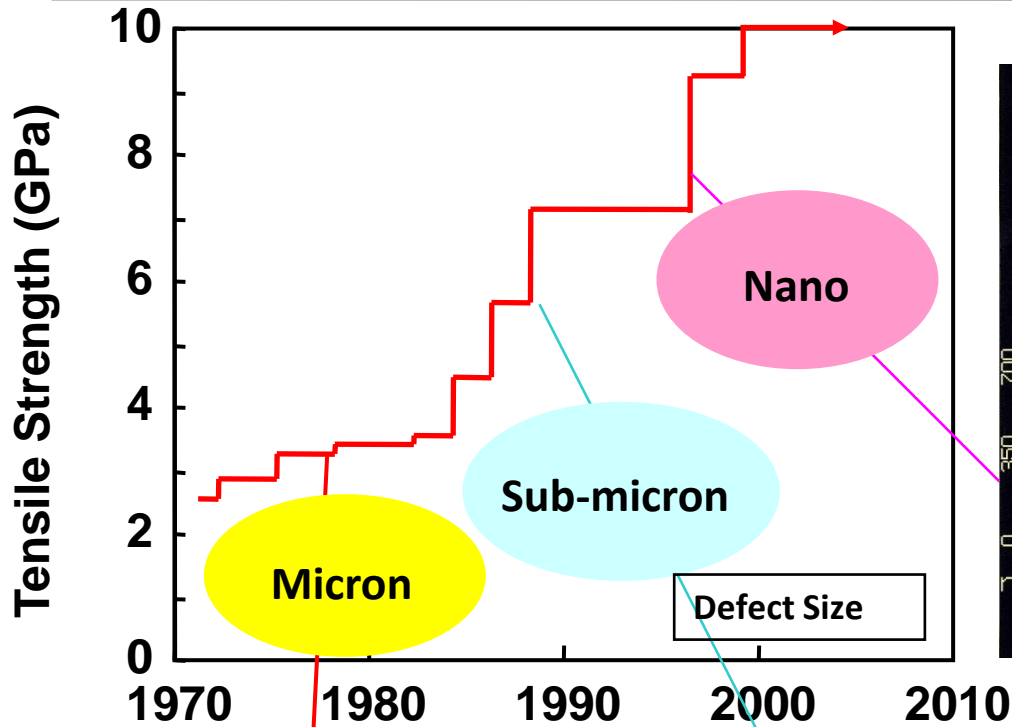
# TORAYCA® Carbon Fiber

- World's first commercialization
- World's largest supply capability
- Highest performance in both strength and modulus
- Wide variety of products (Tow size: 1K~48K)
- Interphase design capability
- Highest consistency and quality
- Long term historical database

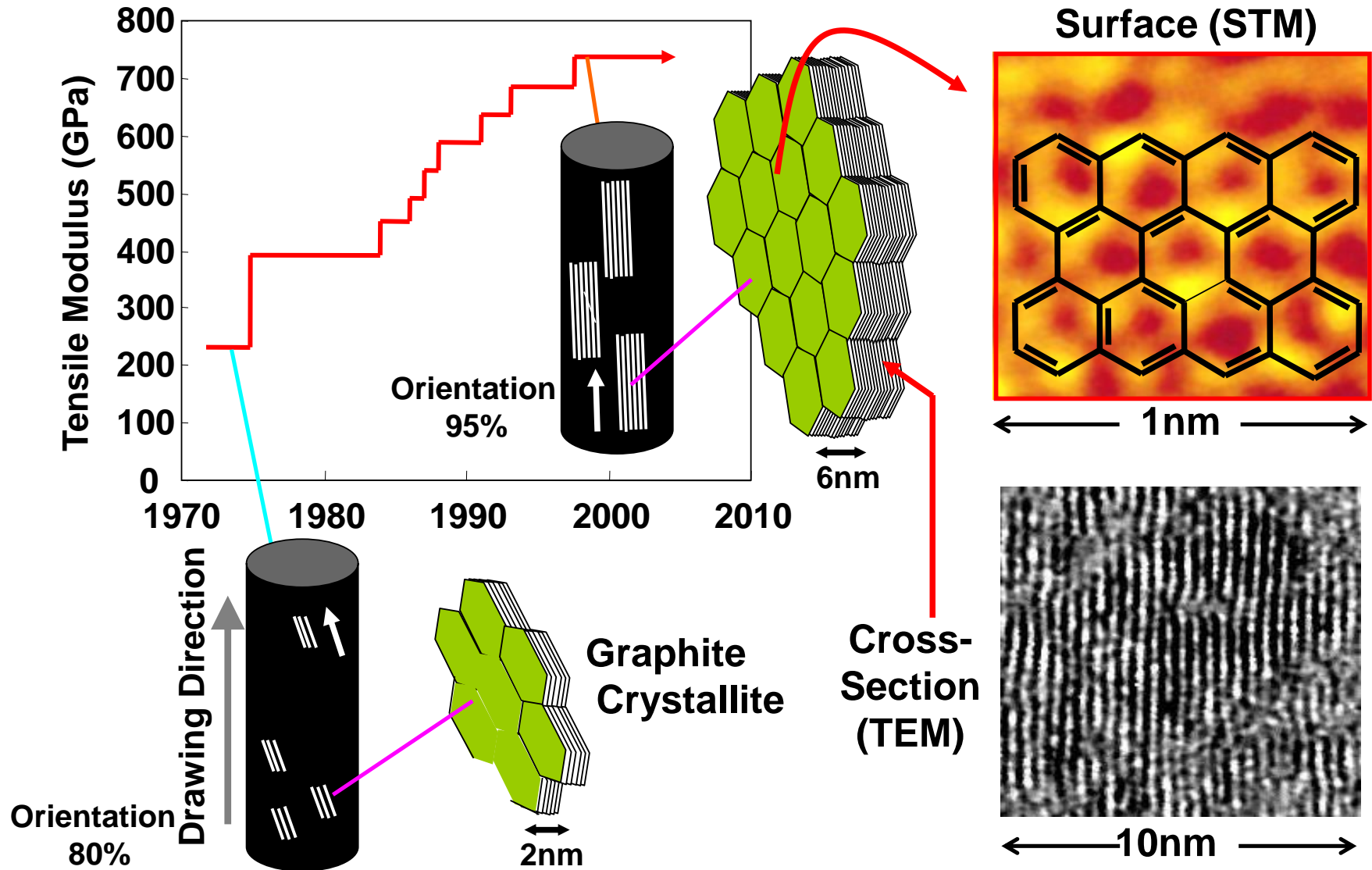




# Challenge for Strength



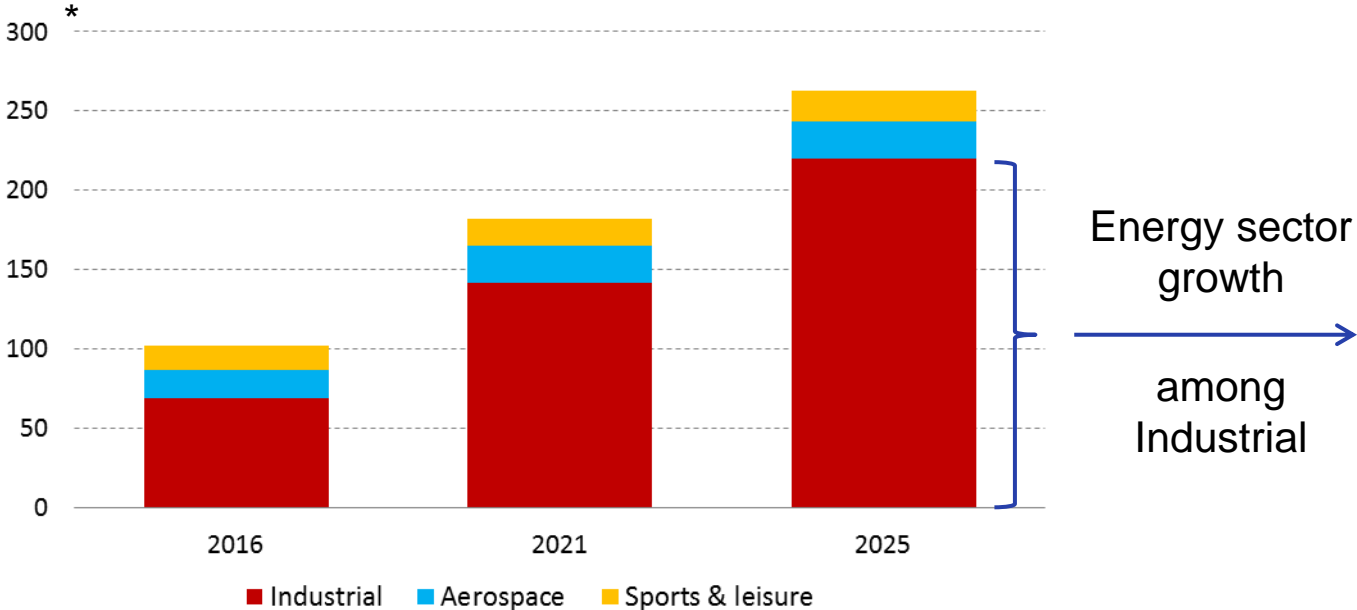
# Challenge for Modulus



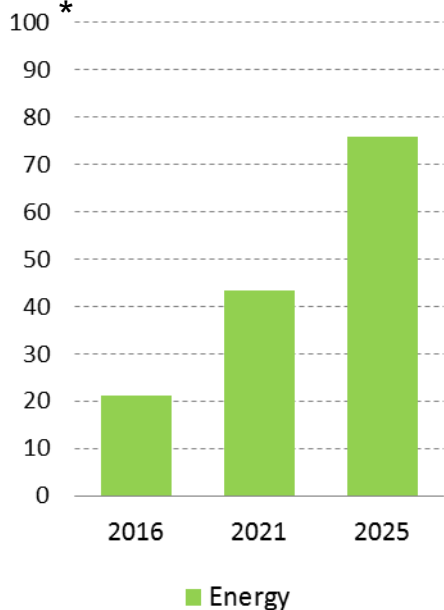


# Carbon fiber market perspective

Global Carbon Fiber demand



Energy



\* estimation, kt/year

Source: Composites Forecasts and Consulting LLC

**'TORAY'**

**Innovation by Chemistry**