

Karbono zuntzak

Rafa Muñoa
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Zarautz

→ Karbono zuntzak nola egiten diren



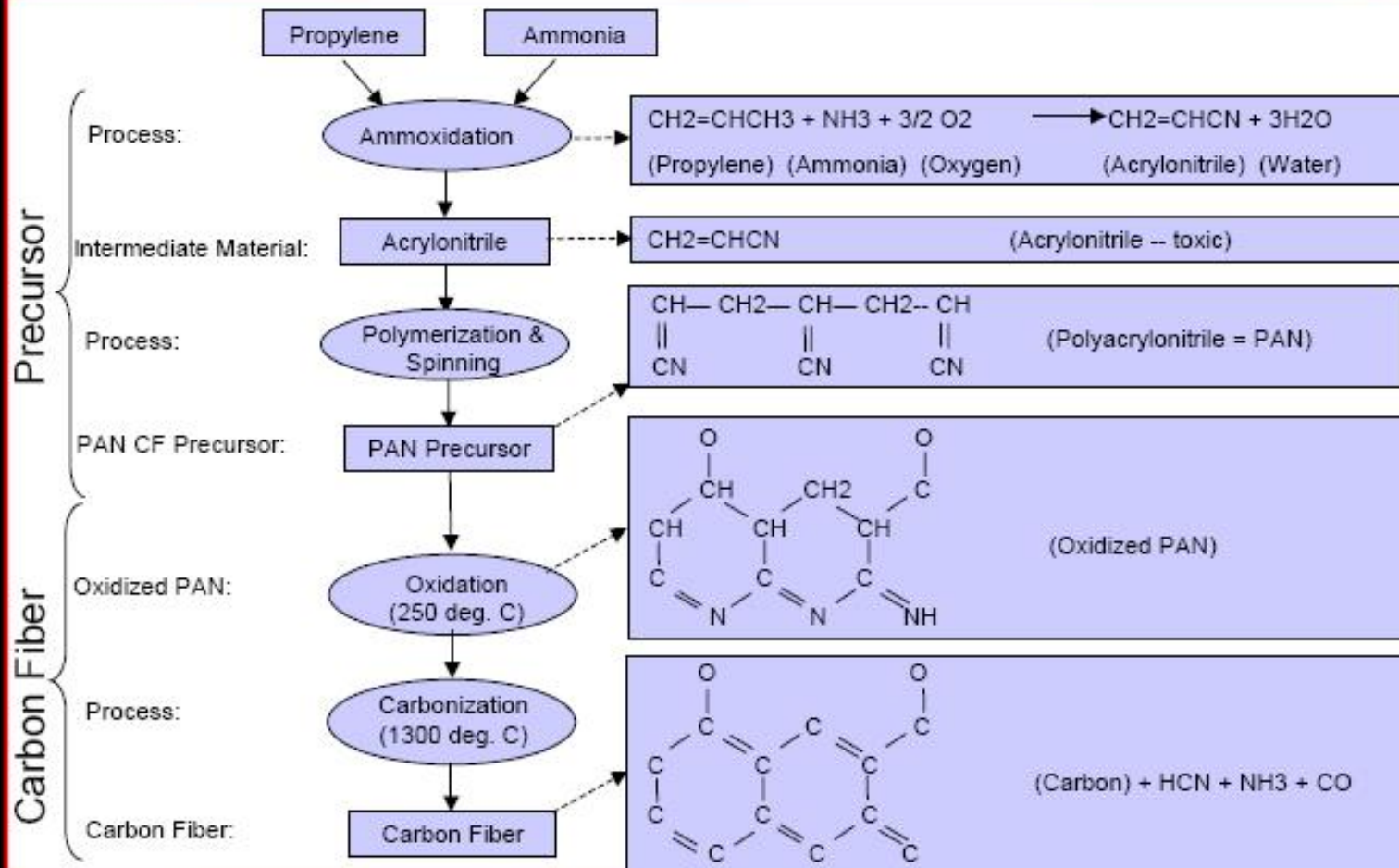
→ Ezaugarriak



→ Karbono zuntzen erabilpenak

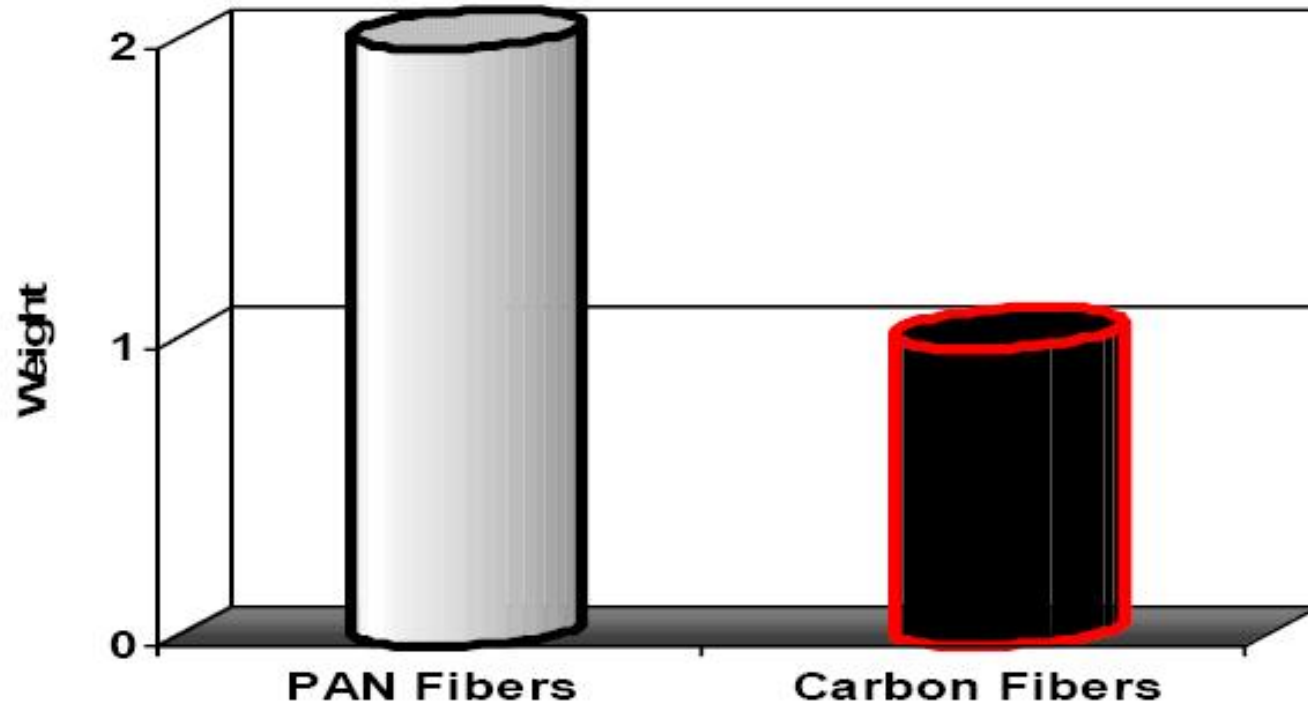


MANUFACTURING PROCESS



COST DRIVE: PAN

2 lbs PAN is required to make 1 lb CF
(Std. Modulus)



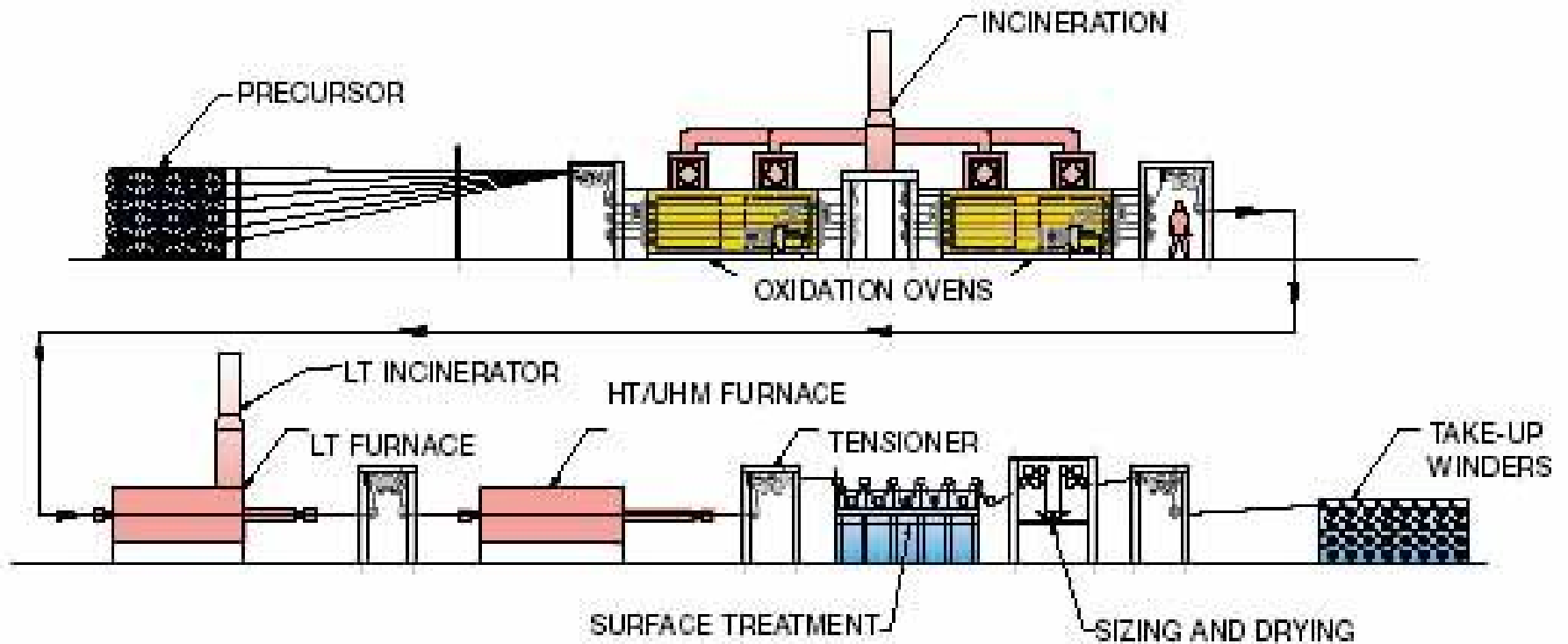
ACRYLIC AND PAN PLANT

Mitsubishi Rayon

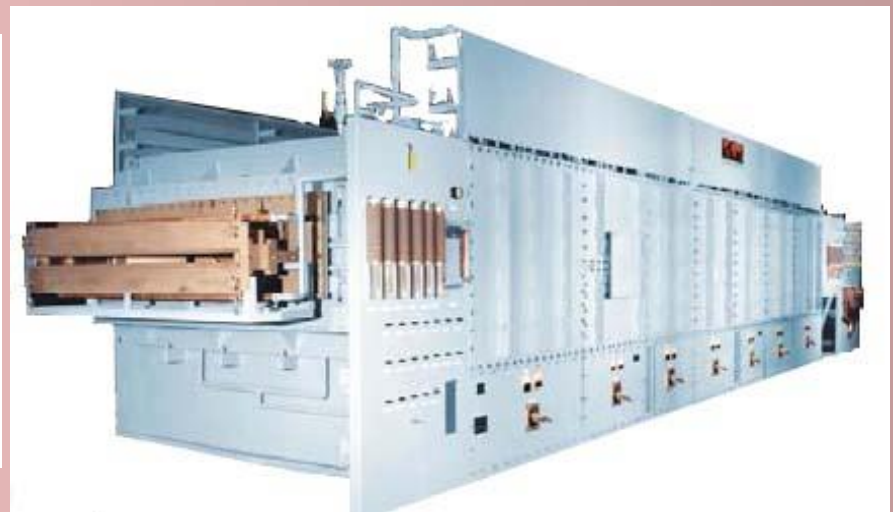


PAN-CF CONVERSION PLANT





PAN-Based Fibers - Harper now offers complete **PAN-based** processing systems. For decades the Harper name has been synonymous with advanced carbon fibers thermal systems and technology due to its totally integrated supply, precise atmosphere and temperature controls, superior gas-tight designs and unique, energy -saving features.



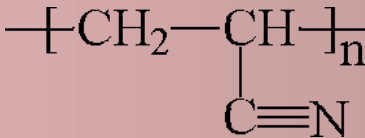
LT Carbon Fiber Furnace Systems



HT Carbon Fiber Furnace Systems

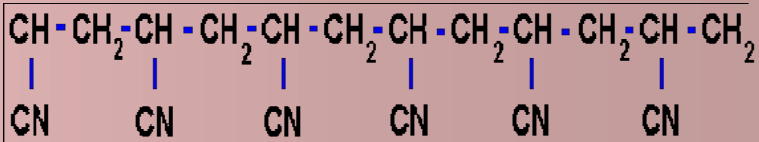


Karbono zuntzak



Karbono zuntzak nola egiten diren

The basic unit of PAN is:



Karbono zuntzak egiteko, material hauek erabil daitezke:

- PAN (poliakrilonitrilo)
- Petrolioaren hondarra (pitch)
- Rayon

Oinarrizko prozedura:

- biraketa
- egonkortzea
- karbonizazioa
- akabera

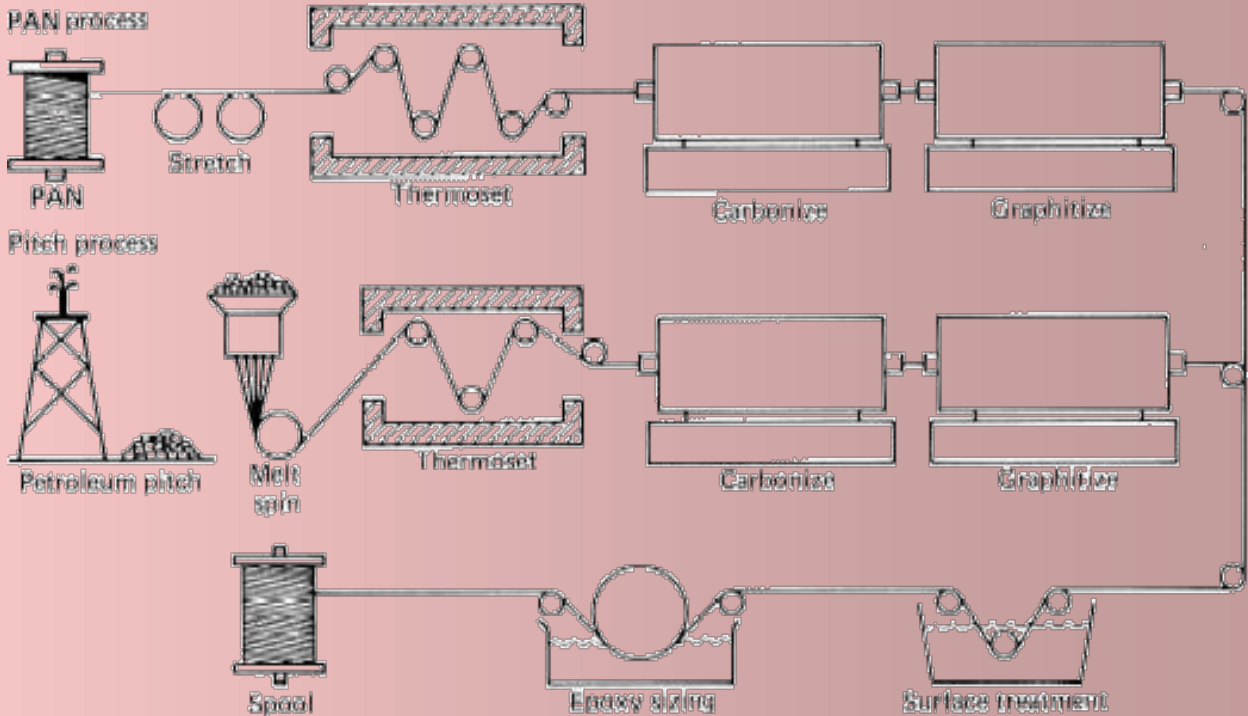


Fig. 1 The processing sequence for polyacrylonitrile (PAN) and mesophase-pitch-based precursor fibers shows the similarities for the two processes. Highly oriented polymer chains are obtained in PAN by hot stretching, while high orientation in pitch is a natural consequence of the mesophase (liquid crystalline) order.

Karbono zuntzak

Karbono zuntzak nola egiten diren

PAN (poliakrinitrilo) polimeroa biratzen da, filamentuak lortzeko. Horretarako, ehungintzako tresneria erabiltzen da, zenbait aldaketa egin ondoren.

Egonkortze-prozesuan, PAN zuntzak tenkatu eta aldi berean berotu egiten dira 200°-300°C-tara, oxigenoaren presentzian.

Honela, ehunak orientatu eta korapilatu egiten dira, ondoren tenperatura handiagoak jasatzeko, deskonposatu gabe.

Karbonizazioan, zuntzak berotu egiten dira 1000°-1500°C-tara atmosfera inertean. Honela, %95 karbono duen materiala lortzen da.

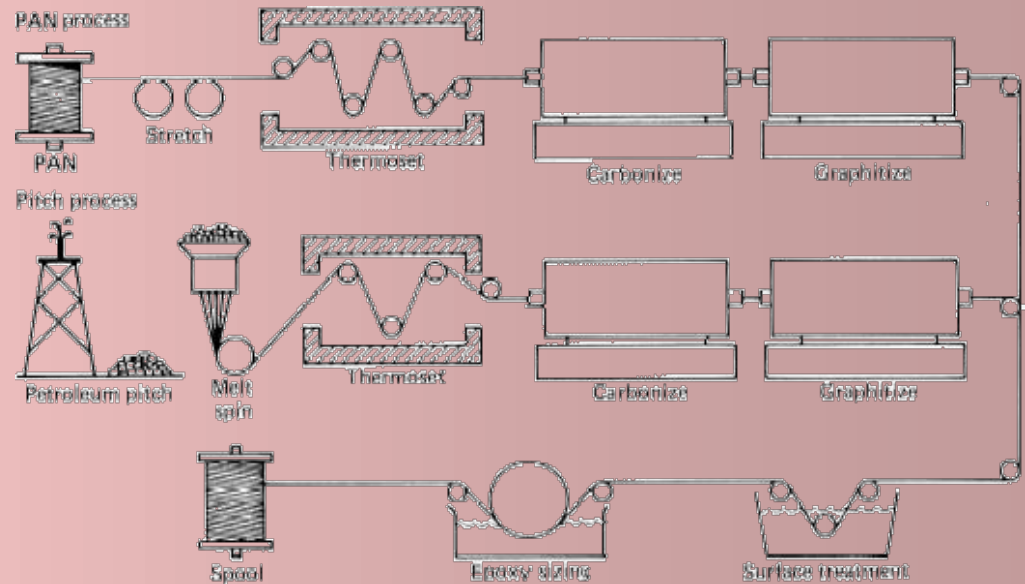
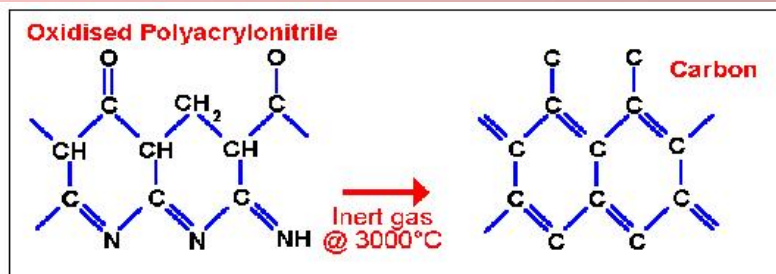
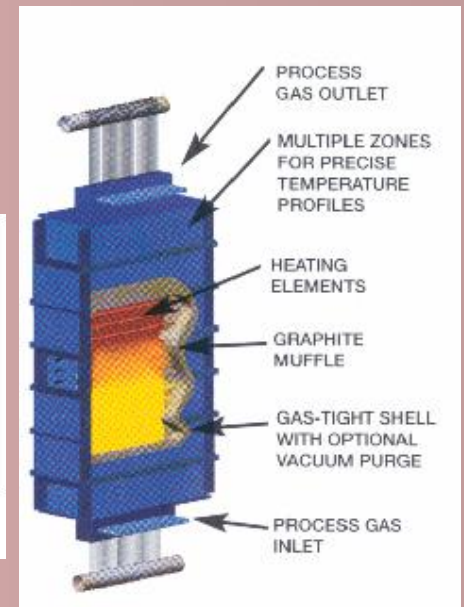


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The temperature will determine the grade of fiber produced:



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Karbonizazioa egin ondoren, zuntzen azalera tratatu egiten da, matxizearekin hobeto lotzeko.

Hori dela eta, alkohol, karbonilo eta karboxilo taldeak sortu behar dira.

Petrolioaren hondarra ere erabil daiteke, PAN erabili beharrean (petrolio, asfaltoa...).

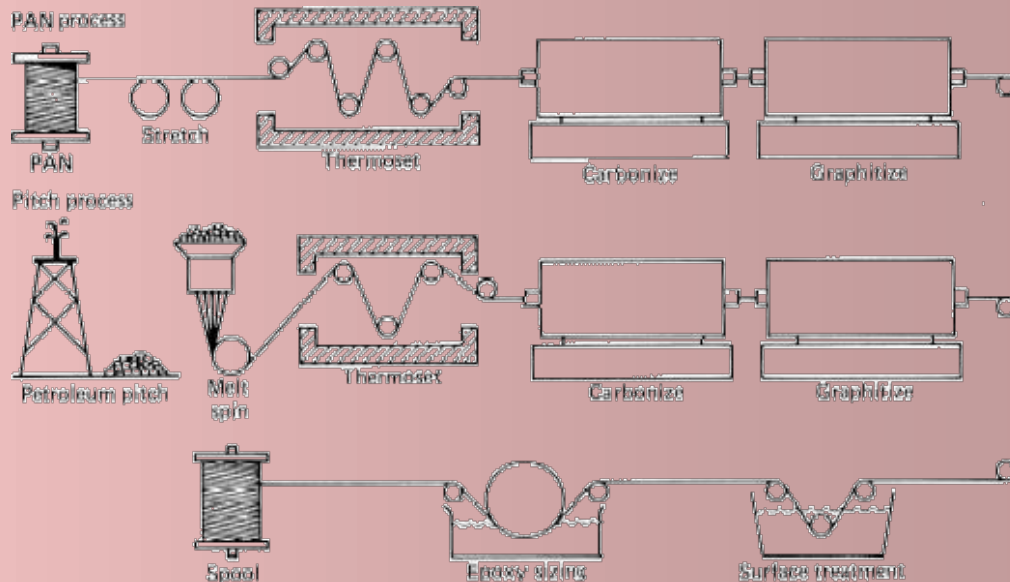
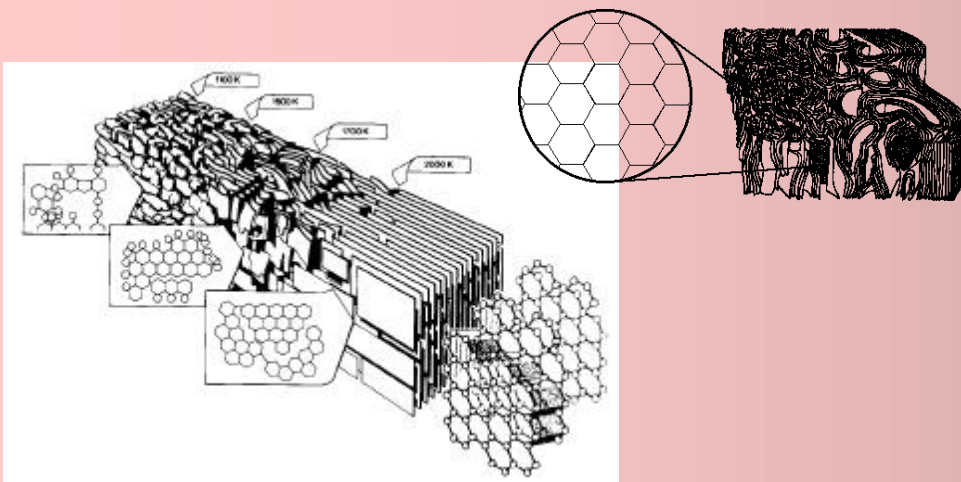


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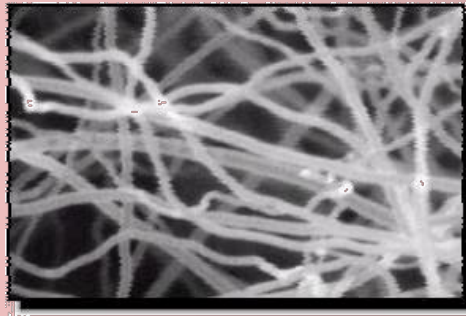
Figure 3.19 Model of how sheets are arranged in carbon fiber. Inset shows hexagonal array of carbon atoms.



Derived from A Cost Assessment of Conventional PAN Carbon Fiber Production Technology, commissioned by ORNL (Das, S., and Cohn, S. M., Internal Report, Oak Ridge National Laboratory, Nov. 1998). Source: ORNL

Karbono zuntzak

Ezaugarriak



Carbon nanotubes imaged by scanning electron microscope.



And increasingly in more critical parts of the aircraft

Altzairua (1020) baino 5 aldiz sendoagoa eta 5 aldiz arinagoa da karbono zuntza.

Aluminioa (6061) baino 7 aldiz sendoagoa eta 1,5 aldiz arinagoa da karbono zuntza.

Matrize egokiarekin konbinatuta, korrosioaren aurkako material hoberenetakoa da.

Bere ezaugarri elektrikoak direla eta (eroalea) ordenagailu eta erlazionatutako produktuetan elektrizitate estatikoa eliminatzeko erabiltzen da.

Karbono zuntza, $7 \mu\text{m}$ -ko diametroa duen zilindro gisa dela pentsa daiteke. Zilindro horiek orientatuta daude.

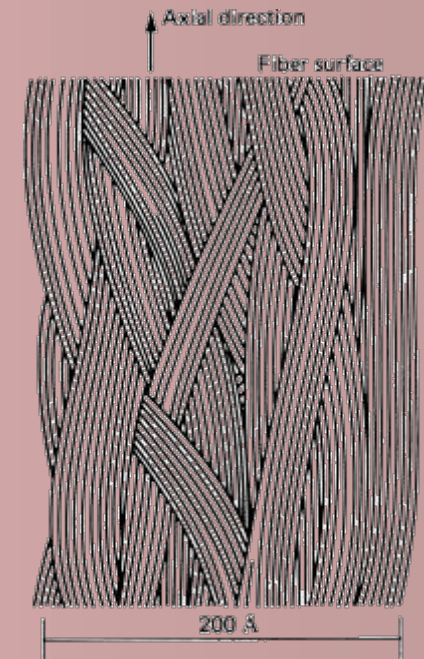


Fig. 2 The undulating ribbon structure of the graphene layers for a PAN-based carbon fiber with a 400 GPa (5800×10^5 psi) modulus. The ribbons at the surface have lower amplitude than in the core. There are about 20 graphene layers in the ribbons in the core and about 50 near the surface.

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Erabilpena

Industria aeroespazialean
•Osagai arin eta sendoak behar dira

Kirol gaitan

Aplikazio komertzial eta industrialak

Medikuntza

•Karbono zuentzeko zenbait gai ez dute errefusik sortzen, gorputzean kokatuta ere iraunkorrak dira eta nahi diren propietatezkoak lortzen ari dira.



Carbon fibers are found in the interiors of nearly all new aircraft



And increasingly in more critical parts of the aircraft



Arrow Carbon Fiber SlipOns
RSV-R and Factory

Ikerketak

Karbono-zuntzaren inguruan egiten diren ikerketaren zati handi bat, kostuaren murrizketaren bidean dira, eta produktuak azkar nola ekoiztu.

Karbono fibrak oraindik estandarizazio bidean daude; gaur egun metalen atzetik doa aplikazioei dagokionez, baina bere erabilera orokortu egingo da.