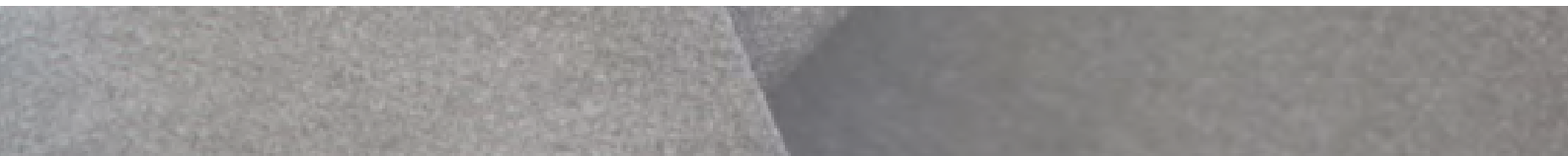




Activated Carbon Fibers and Textiles



Introduction

Made from phenolic resin Kynol Novoloid fiber has three dimensionally crosslinked chemical structure and contains already 76% of carbon. Therefore, Kynol textiles are able to be carbonized and activated without melting (solid-phase carbonization). This generates Kynol carbon and activated carbon textiles directly from Kynol precursor nonwoven, fabric, etc. They can be used directly for further processing. Hereinafter, all Kynol activated carbon fiber and textiles are generally mentioned as Kynol activated carbon products.



Key Characteristics and Properties

Kynol activated carbon products have sharp distribution of micropore with peak top between 0.5 to 1.0 nm. The peak tops are slightly shifted in according to higher activation degree, in other words of higher specific surface area. Additionally, these micropores are directly exposed on the surface of the fiber, which results in very fast adsorption and desorption speeds.

Kynol activated carbon products have comparatively high strength and smooth surface. Thus, they do not generate much particles of themselves, which make its handling easy for applications.

Because Kynol activated carbon products are carbon materials, they show electro-conductivity unlike zeolite or silica gel, typical other adsorbents.

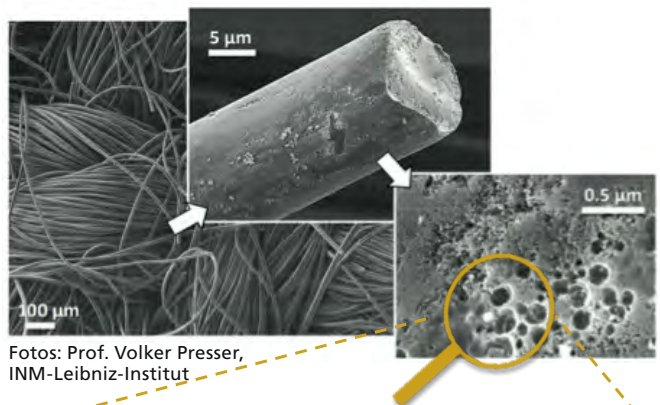
Specification overview (precursor fiber: 2.2 dtex)

Fiber diameter	9 - 11 μm
Specific surface area (BET) *1	800 - 2500 m^2/g
Average micropore diameter	0.7 - 0.9 nm
Toluene gas adsorption capacity *2	30 - 80 wt. %
Methylene blue adsorption capacity *2	310 - 380 mL/g

*1 20°C, 65% RH

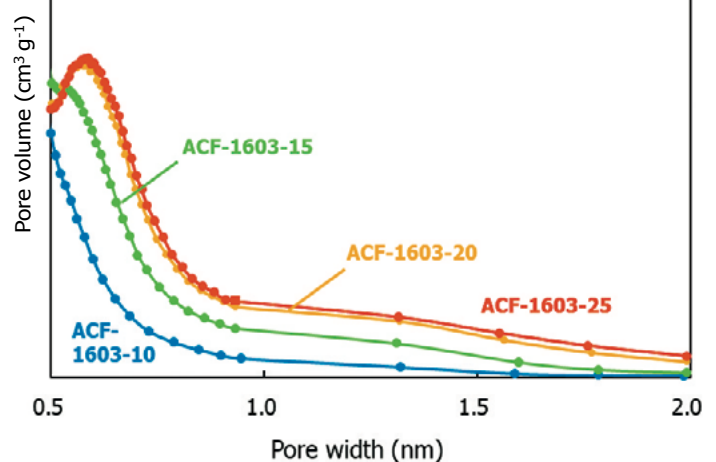
*2 JIS K 1474 method

SEM images of Kynol activated carbon surface



Micropore distributions

77 K N_2 adsorption-desorption isotherm measurement
Interpreted by using Horvath-Kawazoe (HK) method



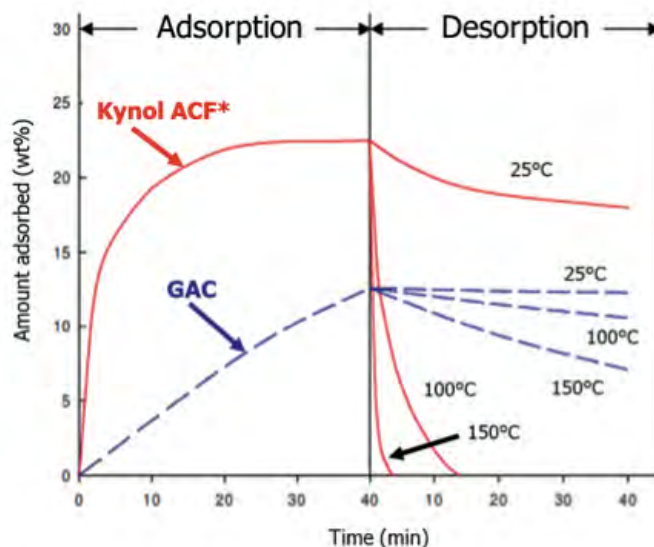
Fast Adsorption and Desorption

Kynol activated carbon products show very fast adsorption performance, and desorption speed under heating conditions compared to equivalent specific surface area of granular activated carbons (GAC), even under low adsorbate concentration. (See right figure)

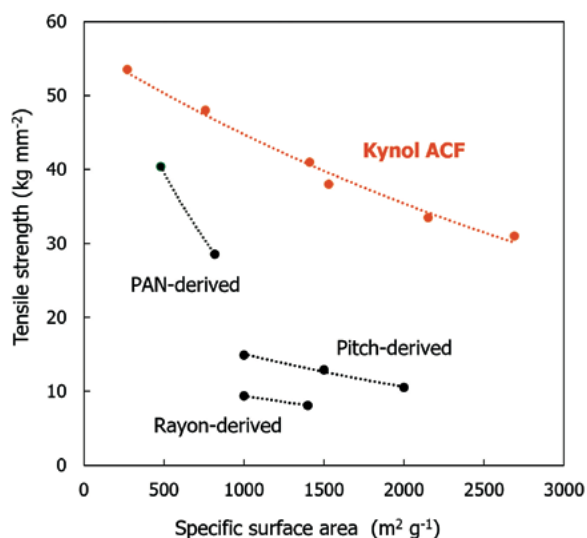
The fast adsorption-desorption kinetics of Kynol activated carbon products lead to technical and economic benefits, among which are thinner and more compact filter substrates, lower pressure drops, shortened cycle times, reduced exposure of adsorbates to heat and thermal degradation during desorption.

Generally, adsorption speed of Kynol activated carbon products is 10~100 times faster than GAC's because of exposed micropores on the surface. Among other activated carbon fibers, Kynol activated carbon products are able to be activated to more than 2000 m²/g. This enables them to generate large pore volumes. Additionally, Kynol activated carbon products show high hydrophobicity without any treatment compared to others. This is the reason why Kynol activated carbon products show excellent adsorption abilities for organic molecules from water (steam).

Toluene: 750 ppmv, 2,5 cm/sec at 25°C for adsorption



*ACF: Activated Carbon Fiber



Good Tensile Strength

Kynol activated carbon products have not only an amorphous but also dense carbon structure. They show high mechanical strength even in high activation degrees (i.e. high specific surface area (SSA)). This characteristic prevents making carbon dusts from absorbent and enables it to be unique among other synthetic fibers derived activated carbon fibers, and broaden its application field.

No Impurities

As Kynol activated carbon products do not contain impurities like minerals or nitrogen, using Kynol activated carbon products is free from any contamination in adsorption systems or minimizing catalytic degradation of solvent in solvent recovery systems. Beside that, Kynol activated carbon products show relatively high „hydrophobicity“ compared to others, because of less oxygen and nitrogen atoms on the surface of carbon structure.

Element compositions		
Kynol ACF	Rayon-based ACF (Standard grade)	PAN-based ACF (Standard grade)
C, H, O	C, H, O, P	C, H, O, N

Applications

Filters for Industrial Use:

- VOC (Volatile Organic Compounds) recovery system
- Water purification
- CO₂ capture system (DAC: Direct Air Capture)
- Metal recovery



Life Sciences, Medical:

- Anesthetic gas control resp. collector
- Filter of mask
- Odour capture
- Chemical microanalysis

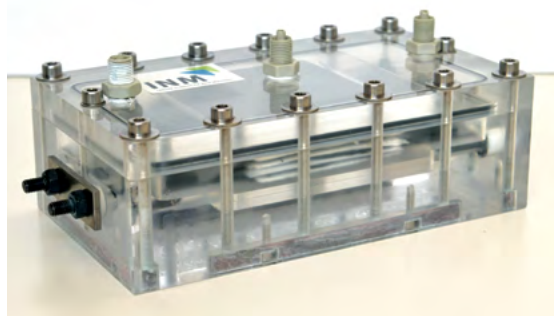


Military & Safety:

- CBRN protection
- Radioactive filtration

Electrodes:

- Rechargeable batteries
- CDI (Capacitive de-ionization)
- EDLC (Electric Double Layer Capacitor)
- Electrochemical-assisted fermentation (e.g. eSuccinate)



Kynol activated carbon products add value to your various products.

**Kynol Europa GmbH
Borsteler Chaussee 55
22453 Hamburg / Germany**

**Phone: +49 - (0) 40 - 53 00 45-0
Fax: +49 - (0) 40 - 53 00 45-45
E-Mail: mail@kynol.de**

www.kynol.de

The information presented in this pamphlet is accurate to the best of our knowledge and belief; however it is not intended as a definitive description of Kynol activated carbon products and their characteristics and applications. This information is furnished without charge solely for your analysis and evaluation.

Kynol Europa GmbH and Gun Ei Chemical Industry Co., Ltd. make no representation or warranty whatsoever, expressed or implied, with respect to this information, Kynol products, or the use of either and disclaim any and all liability and responsibility in connection therewith. The user of this information assumes all responsibility for the determination of and compliance with any applicable health and safety requirements.

Use of the information or the products or manufacture or sale of the products may constitute the exercise of one or more claims or patent applications or registrations. Nothing herein contained shall be deemed to authorize the use of any such patent application or registration or of the trademark „Kynol“.