

Molecular Filtration for Clean Air



Leadership in Filtration

**MANN +
HUMMEL**

Invisible but indispensable

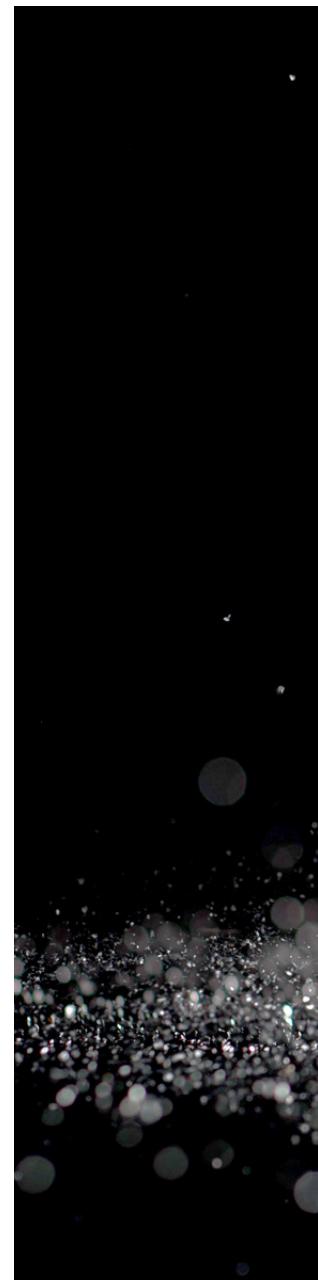
AIR AND GAS FILTRATION

Like water and food, clean air is essential for all animate beings. Air impurities like toxic gases or odors impair our lives, result in a less work efficiency and in worst case, can make us ill.

The supply of filtrated and clean air does not only make our life more pleasant, it is also indispensable in or after many production processes. Individually optimized filter media and a thorough process analysis are necessary to provide the purified air effectively and economically.

MANN+HUMMEL Molecular Filtration is specialized in the production of filter media for all kinds of molecular filtration applications.

With nearly 50 years of experience in molecular filtration, we are the perfect partner to make your air breathable!





OUR KNOW-HOW AND EXPERIENCE KEEP YOUR AIR CLEAN

For decades, MANN+HUMMEL Molecular Filtration has been a leader in the development and production of highly efficient adsorptive filter media based on activated charcoal, molecular sieves and ion exchange resins.

With our innovative and diversified development team we design individual filtration products and solutions for the challenging requirements of the worldwide air purification industry.

Thereby, we are focusing on the treatment of supply air, the filtration of recirculation air and the cleaning of exhaust air to remove odors and pollutants and to fulfill legal and process requirements.

Expertise in molecular air filtration

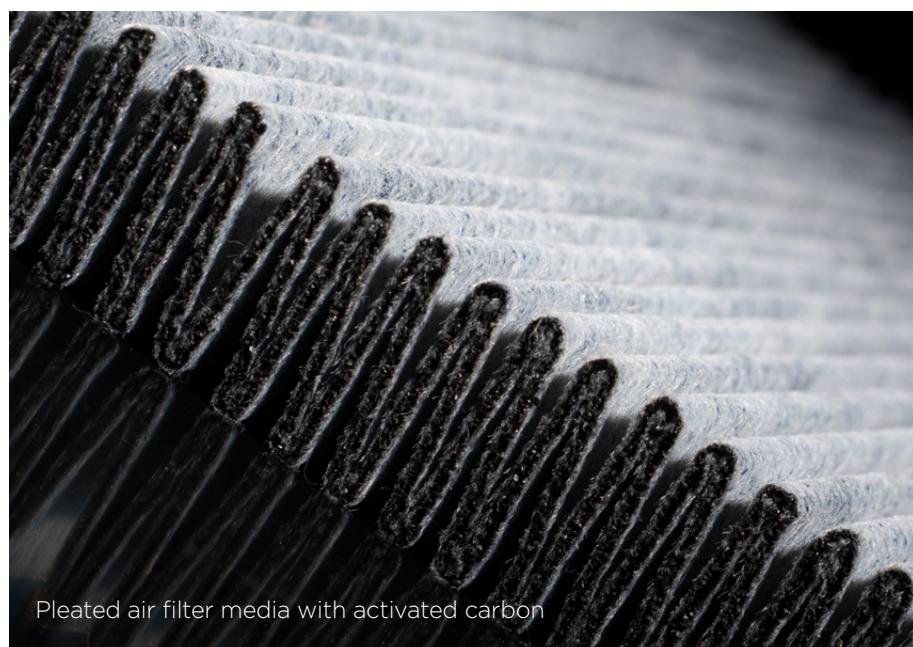
LARGE DIVERSITY OF PRODUCTION PROCESSES

MANN+HUMMEL Molecular Filtration covers a very broad spectrum of diverse and tailored manufacturing possibilities having a high process depth:

- Fabric, foam and nonwoven processing
- Flame lamination, aqueous and foulard impregnation
- Spray-coating
- Ceramic extrusion
- 3D-thermo-forming

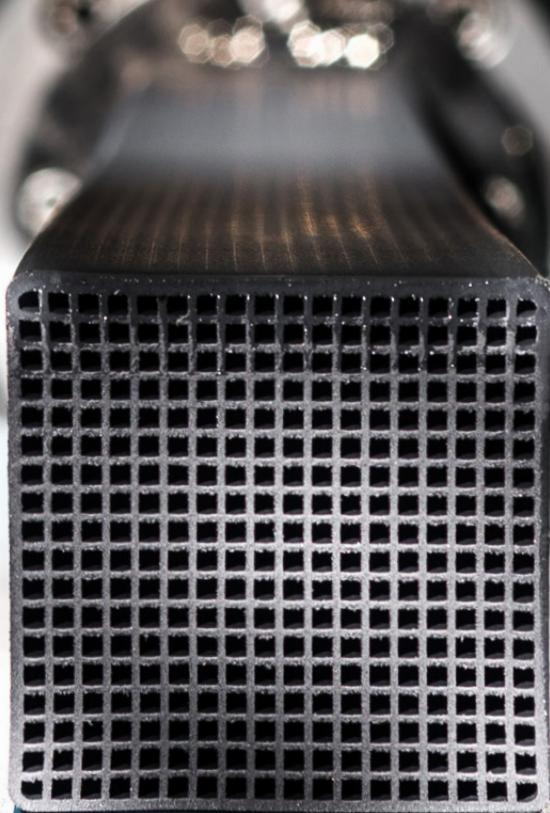
Our "raw" filter media can also be finished by different confection steps like pleating, assembling, stamping, cutting and trimming.

This plenitude and diversity of production processes paired with flexibility, precision and reliability is of high value to our customers and makes MANN+HUMMEL unique in the molecular filtration filter market.



Pleated air filter media with activated carbon

MANN+HUMMEL has been a filtration specialist for more than 80 years. Leadership in Filtration is what drives us.



Extrusion of activated carbon honeycombs

SALES AND QUALITY

In addition to our competence in development and manufacturing, we strive for a culture of communication and customer service to link your requirements with our filtration solutions.

The promise of the MANN+HUMMEL Molecular Filtration sales and key account team is to be this link. From the first contact up to the end of the project we are your reliable and competent business partner.

Quality is made by human beings! That's why the human beings – as a customer, a supplier, an employee or an end-user – are in the middle of our thinking and acting. Successful work and outstanding quality are the results of comfortable working conditions, efficient and well optimized manufacturing processes and a purposeful communication paired with a high quality consciousness. With our certifications DIN EN ISO 9001, 14001 and 50001 we at MANN+HUMMEL Molecular Filtration are living this!



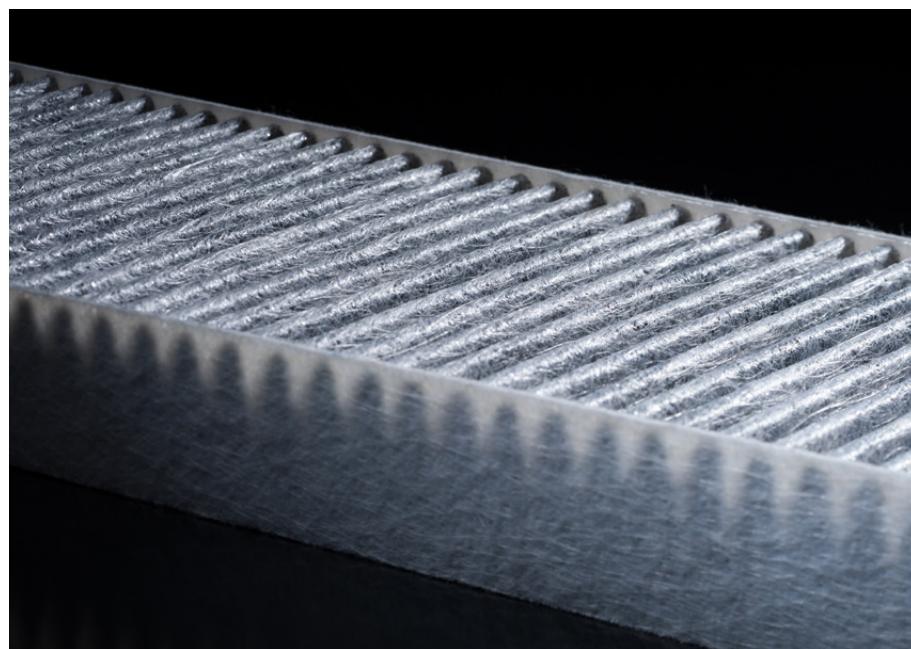
Principles of molecular filtration

FUNCTIONALITY AND PROPERTIES

The physical principle of adsorption is the main function of the filter media that we produce.

Here, molecules accumulate on the surface of a solid by Van-der-Waals attraction forces. This reversible process works better the larger the molecule is and the higher its boiling point.

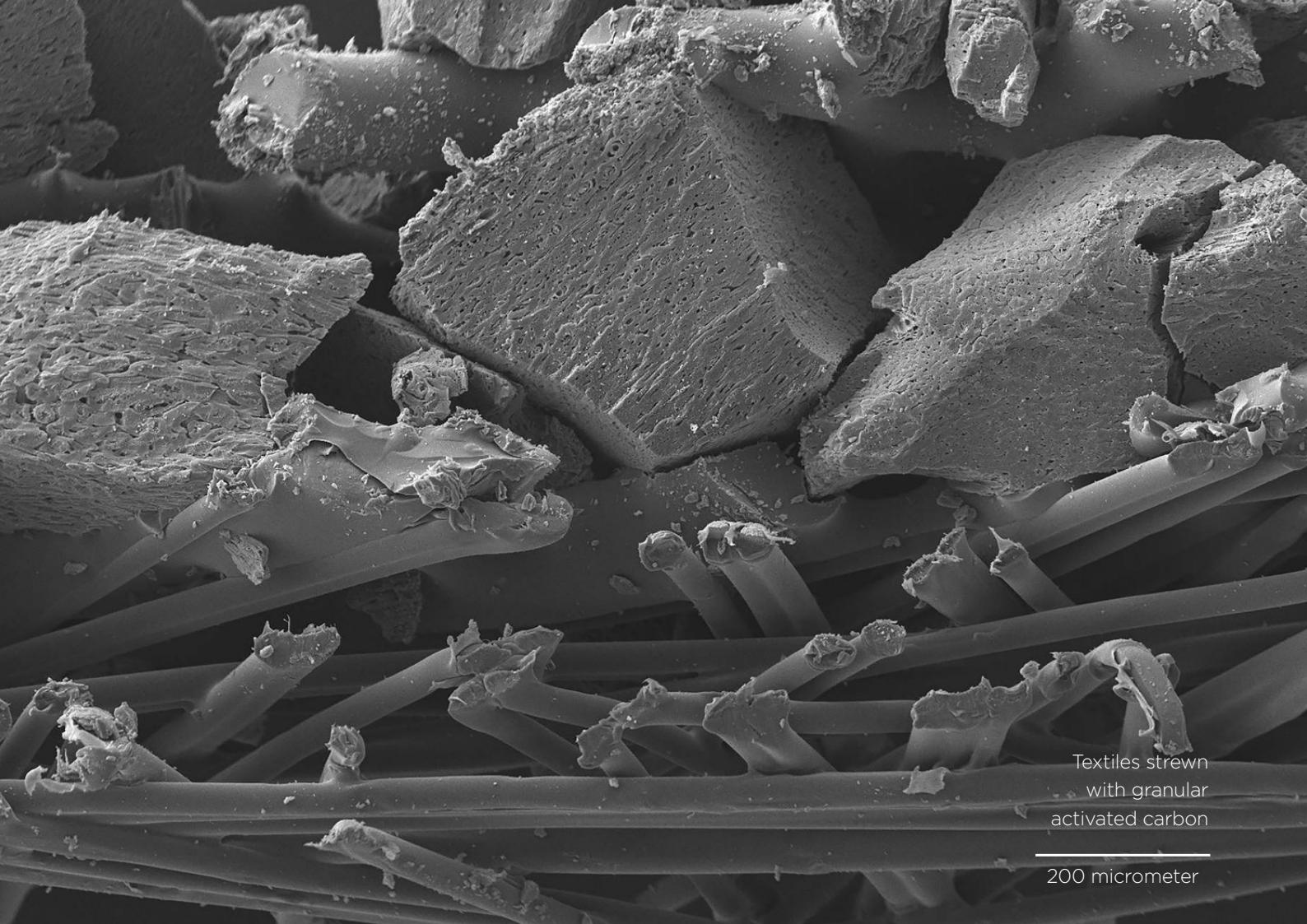
For light molecules with very low boiling points, we use the principle of chemisorption to eliminate them from air. In this process, the molecule reacts with the surface of the filter medium and is bonded irreversibly to it.



ADSORBENTS

The solids we use are called adsorbents and are characterized by their large inner surface area which is build up by an intricate system of pores — such as activated charcoal, silica gel, molecular sieves or ion exchange resins.

For example, a teaspoon (ca. six grams) of activated charcoal has an inner surface area of $7,140 \text{ m}^2$, which is the size of a standard FIFA soccer field. Considering, that the size of odor molecules are in the range of 1 nm^2 , there is much space to capture the contaminants from polluted air.



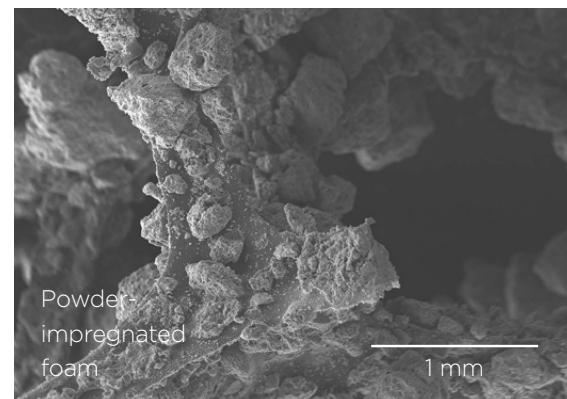
Textiles strewn
with granular
activated carbon

200 micrometer

THE OPTIMAL SELECTION

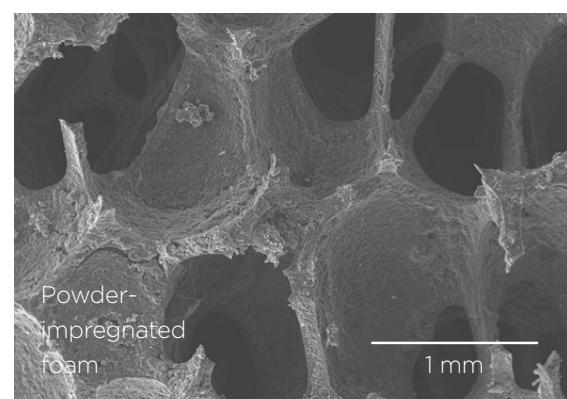
The ambitious challenge of developing and designing a filter media for molecular filtration is to choose the ideal adsorbent(s) with the right surface area, pore size distribution and chemical properties for the specific requirements of our customers.

Here, we can choose from approximately 80 different adsorbents in the form of powders, granules or spheres. By the use of special impregnations, the number of possible applications and the range of contaminants being filtered are permanently extended.



Powder-
impregnated
foam

1 mm



Powder-
impregnated
foam

1 mm

Flexibility, precision and reliability



Foam covered with activated carbon granules

THE EXPERTISE TO MEET YOUR DEMANDS

Due to the high diversity of filter media and applications in the wide field of air filtration, MANN+HUMMEL Molecular Filtration offers a strong development service. Our interdisciplinary and cross-functional innovation team consists of textile engineers, technicians, ceramic experts and chemists to match the challenging demands of our customers.

With this background, we have profound knowledge and experience in raw material selection (textiles, ceramics and adsorbents) and tailored process technologies for the treatment of powdered and granulated materials.

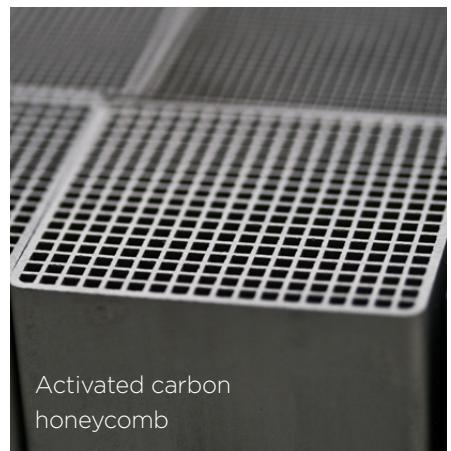


We are keen to accept your challenges and to solve your air filtration problems. Don't hesitate to ask us!

THE HIGHEST PRIORITY IS CUSTOMER SATISFACTION!

With our measuring devices, MANN+HUMMEL Molecular Filtration is able to provide sophisticated analytical service to our customers – during the development process as well as for quality control.

The evaluation and examination of important key-data like pressure drop, capacity or the adsorption behavior/ kinetics of raw materials and filter media is a decisive element for fast development cycles, outstanding product quality and – of course – customer satisfaction. We are able to measure the breakthrough curves of a large number of VOCs, for example n-butane, cyclohexane, toluene and also ammonia, acetaldehyde and trimethylamine at different humidities.



The exact solution for your challenge

	Application	Challenge	MANN+HUMMEL Molecular Filtration Solution
Healthcare	Hospital 	<ul style="list-style-type: none"> ▪ Odors ▪ Special gases ▪ Air Molecular Contamination (AMC) ▪ Volatile Organic Compounds (VOC) 	<ul style="list-style-type: none"> ▪ Significant increase in hygiene and purity. ▪ Improved wound healing of patients.
	Cleanroom 	<ul style="list-style-type: none"> ▪ Particles < PM1 ▪ Corrosion ▪ Air molecular contamination (AMC) ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Corrosion protection of surfaces and machines. ▪ Odor neutrality. ▪ Significant increase in productivity of medical products and services.
	Ostomy 	<ul style="list-style-type: none"> ▪ Odors ▪ Special gases 	<ul style="list-style-type: none"> ▪ Protection against infections on wound dressing. ▪ Odor and acid protection for humans. ▪ Enabling of a hygienic healing process.
Lifestyle	In home 	<ul style="list-style-type: none"> ▪ Odors and ozone ▪ Corrosion ▪ Humidity ▪ Formaldehyde ▪ Particles < PM2.5 ▪ Air molecular contamination (AMC) 	<ul style="list-style-type: none"> ▪ Protection of people, animals and surfaces by highly energy efficient air filters with special functionalities, against acids, bases such as ammonia, formaldehyde but also with efficiency against moisture and pollen. ▪ Improved health and sleep, higher motivation and performance.
	Indoor air 	<ul style="list-style-type: none"> ▪ Odors ▪ Ozone (e.g. printer) ▪ Particles (ISO 16890) ▪ Air molecular contamination (AMC) ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Increasing the efficiency of employees, pupils and students as Clean Air encourages concentration and motivation. ▪ Lowering the short-illness rate in industry by raising the motivation.
	Heritage 	<ul style="list-style-type: none"> ▪ Corrosion ▪ Humidity ▪ Air molecular contamination (AMC) ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Corrosion protection and prevention against acid attack on art treasures. ▪ Damage prevention and reduction of restoration and conservation procedures. ▪ Protection against volatile organic compounds and air molecular contamination from human emissions.

	Application	Challenge	MANN+HUMMEL Molecular Filtration Solution
Industry	Production 	<ul style="list-style-type: none"> ▪ Ozone ▪ Particles < PM1 ▪ Air molecular contamination (AMC) ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Protection against hazardous emissions in processes such as acids, bases, fragrance, stench (smelliness) and particulate matter. ▪ Hygienic packaging processes.
	Pharmacy 	<ul style="list-style-type: none"> ▪ Corrosion ▪ Particles < PM1 ▪ Ozone ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Protection of people, products and machinery. ▪ Further guarantee of odorless and clean emissions.
Environment	Waste 	<ul style="list-style-type: none"> ▪ Odors ▪ Special gases ▪ Humidity ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Protection against odorous/ bad smelling sulfur substances, poisons and surface corrosion protection of sewer systems. ▪ Prevention of explosive atmospheres.
	Farming 	<ul style="list-style-type: none"> ▪ Odors ▪ Special gases ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Protection against emissions of gases, formaldehyde, antibiotics or ammonia. ▪ In european ODA-3 areas gas filters must be used in commercial real estates.
Mobility	Airport 	<ul style="list-style-type: none"> ▪ Odors ▪ Particles < PM1, PM2,5, PM10 ▪ Air molecular contamination (AMC) ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Protection against kerosene odors. ▪ Providing luggage management between aircraft and arrival or departure halls. ▪ Odor protection in shopping malls.
	Vehicles 	<ul style="list-style-type: none"> ▪ Odors and ozone ▪ Particles < PM1, PM2,5, PM10 ▪ Humidity ▪ Special gases ▪ Formaldehyde ▪ Volatile organic compounds (VOC) 	<ul style="list-style-type: none"> ▪ Seat comfort optimization and odor neutralization in the cabin. ▪ Protection against engine fumes by 3D deformed hydrocarbon traps (HC).

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