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ART SAND

Innovative filtration and disinfection material containing carbon nanotubes

TECHNICAL LIST

DESCRIPTION

ART SAND is a patented adsorption and disinfection material based on carbon nanotubes that are immobilized onto inert and natural carrier.

KEY APPLICATION AND BENEFITS

ART SAND was developed for cleaning and disinfection of drinking water and wastewater. Its main target is capturing a wide spectrum of organic micropollutants such as agrochemicals, active medicine ingredients (API), organic contaminants, including chlorinated hydrocarbons, the byproducts of water chlorination.

The main benefit of ART SAND, in comparison with GAU, is its approximately 10x faster absorption kinetics allowing the investor to save more than half of their financial resources (smaller equipment size). Due to approximately 10x smaller volume of the absorption material, the operation costs linked to manipulation are significantly lower.

ART SAND offers the advantage of using non-chemical disinfection of drinking water and microbial decontamination of cleaned communal wastewater for their further reuse. ART SAND removes viral contamination in water and therefore, it is suitable for the non-chemical treatment of swimming pool waters.

ART SAND is suitable for the preparation of ultra-clean water in the pharmaceutical and semiconductor industries.

ART SAND retains minerals in the water.

Due to the fact, that ART SAND removes organic pollutants under the analytical detection limit, it is also suitable for the capture of residual organic substances from water before membrane processes (ultrafiltration, reverse osmosis) to prolong the lifespan of the membrane.

In the area of organic products, ART SAND can be used for biodiesel or alcohol purification from by-products.

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MAIN CHARACTERISTIC

ART SAND consists of dispersed carbon nanotubes formed by catalytic CVD (chemical vapour deposition) process. Its morphology is shown in **Figure 1**.

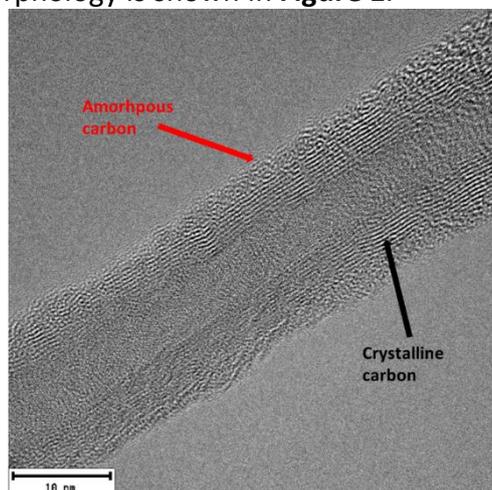


Figure 1. Morphology of a carbon nanotube used in ART SAND adsorption material.

A carbon nanotube is anchored in the natural fibrous structure in a way that restricts them from escaping the demarcated space of usage. The whole structure is then spread using quartz sand that enables acceptable penetration of ART SAND filtration material.

ART SAND consists of approximately 50% water that keeps the material in an active form. Therefore, it is not desirable to let the material dry out.

Disinfection activity ART SAND is demonstrated in a chart below:

	Wastewater	ART SAND technology	Well KERSKO	ART SAND technology
CUMI 22°C [CFJ/ml]	49120	131	3720	15
CUMI 36°C [CFJ/ml]	29840	80	2580	9
KOLI [CFJ/100 ml]	57000	89	210	0
ECOLI [CFJ/100 ml]	27700	16	104	0
ENTERO [CFJ/100 ml]	10700	11	0	0
CLO [CFJ/100 ml]	1000	0	0	0

Explanatory notes:

CUMI22 °C ... cultivable microorganism with growth specification at 22 °C

CUMI36 °C ... cultivable microorganism with growth specification at 36 °C

KOLI ... coliform bacteria

ECOLI ... Escherichia coli

ENTERO ... intestinal enterococci

CLO ... Clostridium perfringens

CFU ... colony forming units

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Figure 2 shows an example of ART SAND's adsorption isotherms measured in the mixture of four typical pesticides (chloridazon,alachlor, metazachlor, metolachlor). **Figure 3** shows the adsorption kinetic of the selected agrochemicals.

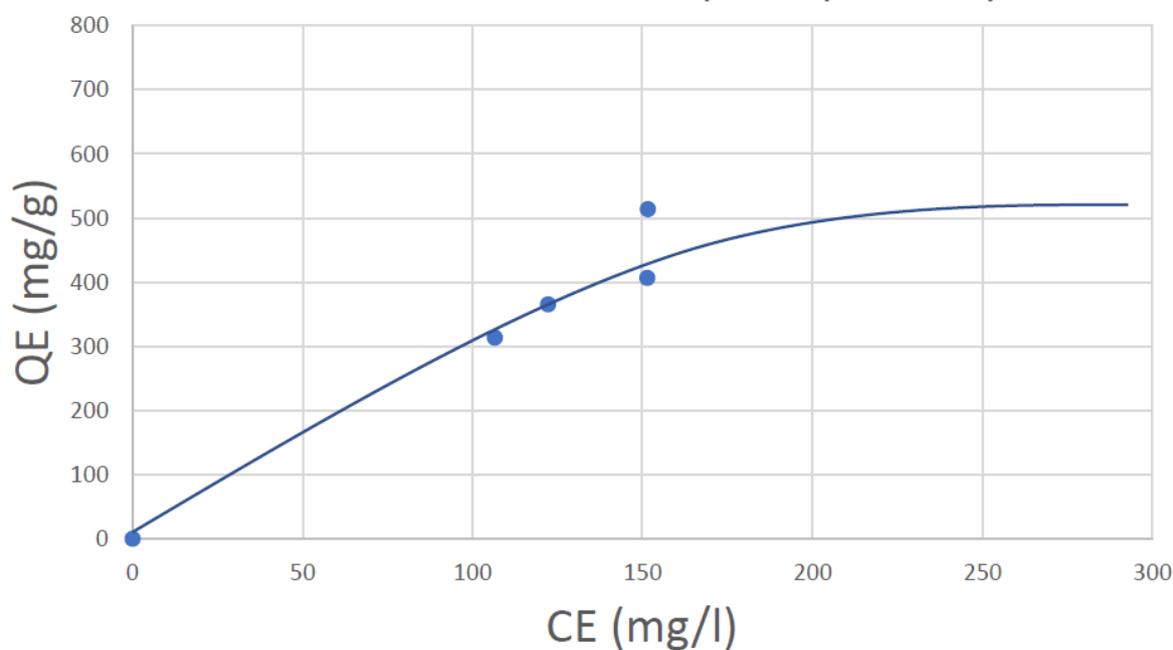


Figure 2. ART SAND's adsorption isotherm measured in mixture of four pesticides (**CE**-equilibrium concentration; **QE**-adsorbed amount in equilibrium).

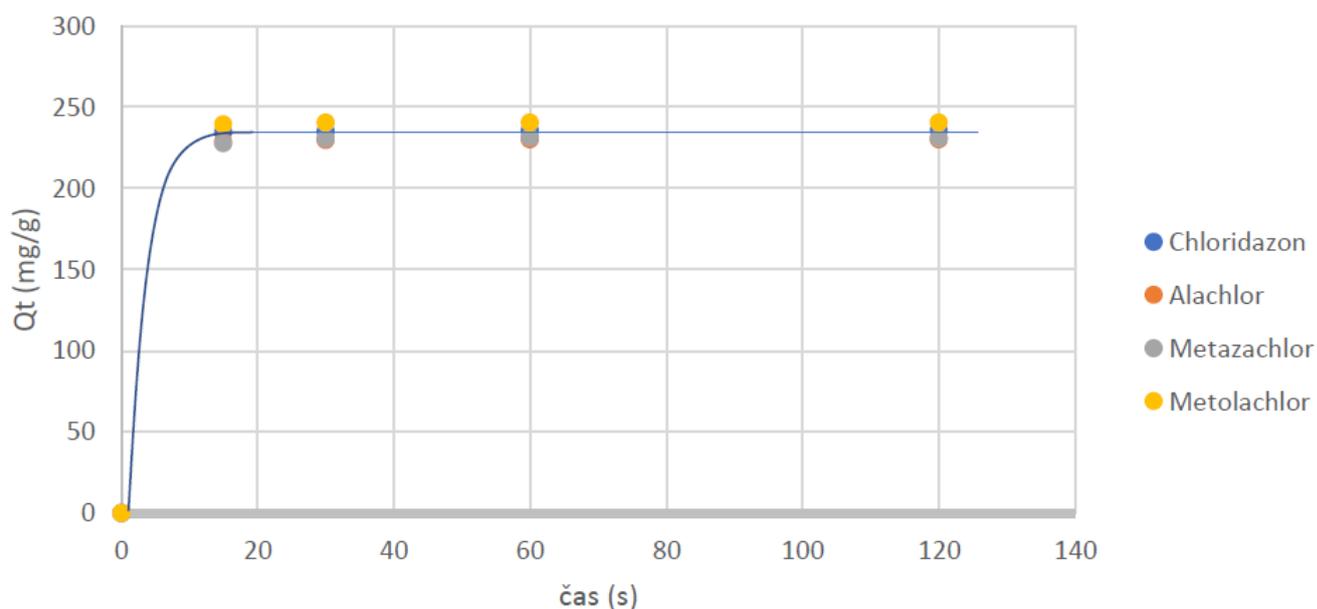


Figure 3. Adsorption kinetics of selected agrochemicals.

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HYDRAULIC LOAD

Hydraulic load of 6 cm thick layer of ART SAND material at pressure difference of 0.2 bar is **31,8 m/h**. This corresponds to 6.8 s contact time of water with adsorption material which is consistent with measured adsorption kinetics. Such a hydraulic load is maximal for proper functioning of filter containing ART SAND adsorption material.

PACKAGING

Art Sand comes in packaging of 10 l (14kg) or 20 l (28kg) plastic barrels for manual manipulation on a crate or plastic 100 l and 200 l barrels for machine manipulation.

MINIMUM ORDER

The minimum order quantity of ART SAND is 7kg in 5 l plastic packages.

Important information: For testing purposes, we allow an order of a 500 g sample packed in a plastic bottle with a double safety lid. Due to the special packaging requirements, there is a similar price as per the 5 l (7kg) plastic barrel.

SAFETY AND HEALTH HAZARD INFORMATION

Every order includes a Safety data sheet (SDS) with all the important information about the safe handling and disposal of ART SAND.



ART CARBON s.r.o. company and its project „Composite filtration material containing carbon nanomaterials“ were supported by Czech ministry of industry and trade and by API agency. Project is cofunded by EU.



Development of ART SAND adsorption material was supported by Central bohemian innovation agency (SIC).



ART SAND is part of a SAWER equipment, developed by CTU for production of drinking water from desert air. SAWER is main exhibition of Czech house on the EXPO 2020.



ART SAND took second place at “Nastarujte se 2019” competition held by Komerční banka.