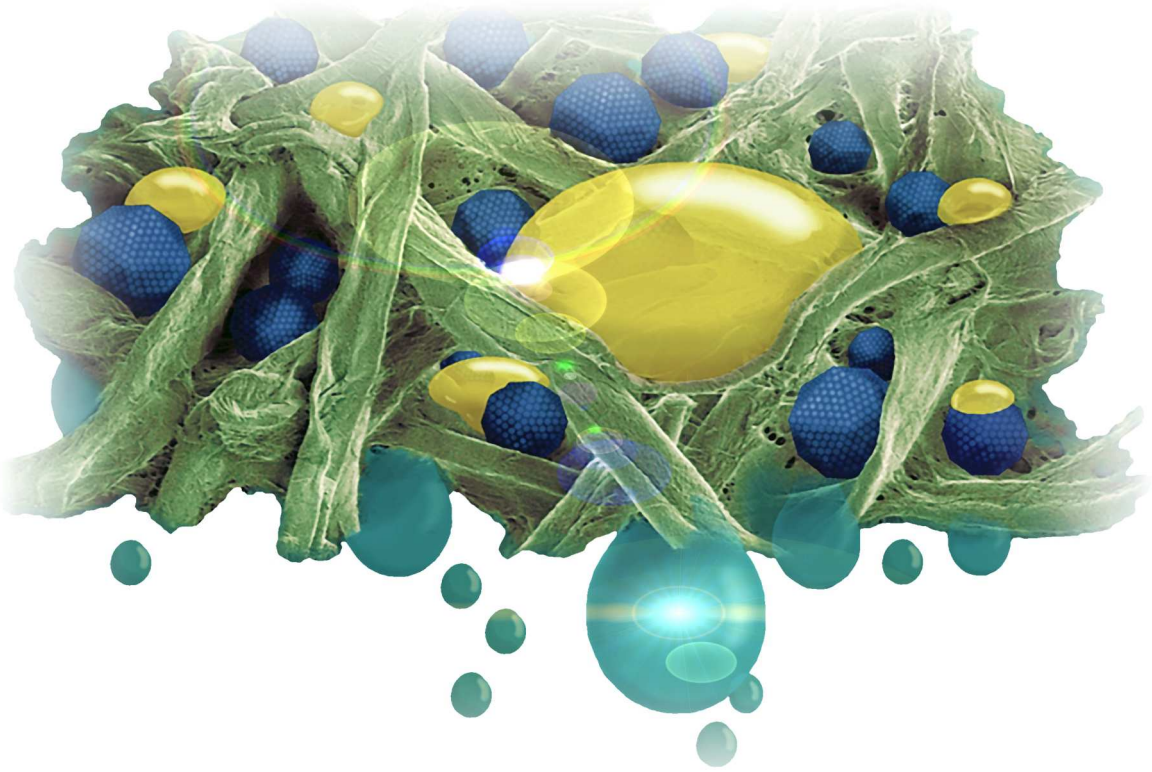
ADVANCED **FILTRATION AND ANTIMICROBIAL** TECHNOLOGIES

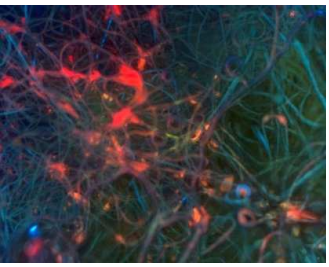


METAL NANOPARTICLES

AGAINST BIOFOULING AND FOR CONTAMINANT REMOVAL

REGIONAL CENTRE
OF ADVANCED TECHNOLOGIES
AND MATERIALS

Palacký University
Olomouc



Fluorescent verification of antimicrobial activity

FILTERS AND MEMBRANES WITH ANTIMICROBIAL PROPERTIES

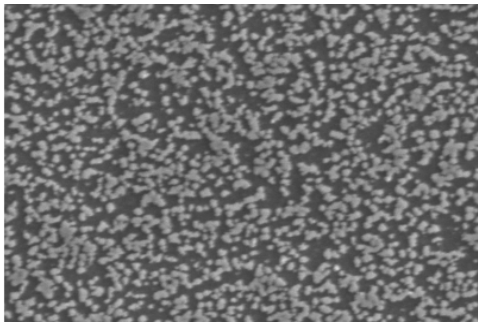
ANTIBACTERIAL/ANTIFOULING TREATMENT OF A VARIETY OF MATERIALS

CHARACTERISTICS OF Ag-MODIFIED FILTRATION MATERIALS

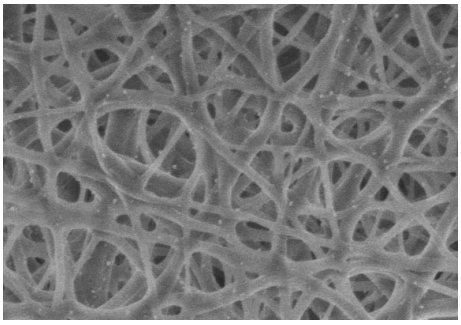
- Patented technology* of covalent immobilization of Ag nanoparticles on solid surfaces
- Universal deposition on substrates of different shapes
- Software controlled process of functionalization (with numerous adjustable parameters)
- Functionalization of dense fibre systems in entire thickness
- Exhibit unique antibacterial/ antifouling properties
- Functionalization of micro-/nano structured membranes and filters
- Controllable release of Ag nanoparticles

EXAMPLE OF ANTIMICROBIAL TREATMENT

FUNCTIONALIZATION OF FLAT MEMBRANES



FUNCTIONALIZATION OF NANO-STRUCTURED MEMBRANES

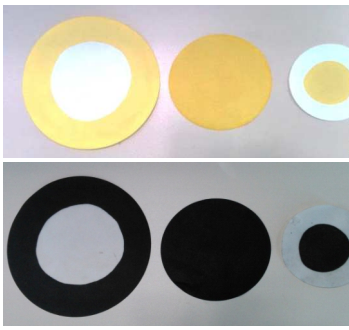


COVALENT ANTIMICROBIAL MODIFICATION OF FIBRE FILTERS BY Ag NANOPARTICLES

* Patent No. CZ303502 (B6) Immobilization method of silver nanoparticles to solid substrates
Paper: Antifungal activity of silver nanoparticles against Candida spp. By: Panacek, Ales; Kolar, Milan; Vecerova, Renata; et al.BIOMATERIALS Volume: 30 Issue: 31 Pages: 6333-6340 Published: NOV 2009

REACTIVE FILTERS FOR CONTAMINANT REMOVAL

FILTRATION FIBRE MATERIALS FUNCTIONALIZED WITH ZERO-VALENT IRON NANOPARTICLES



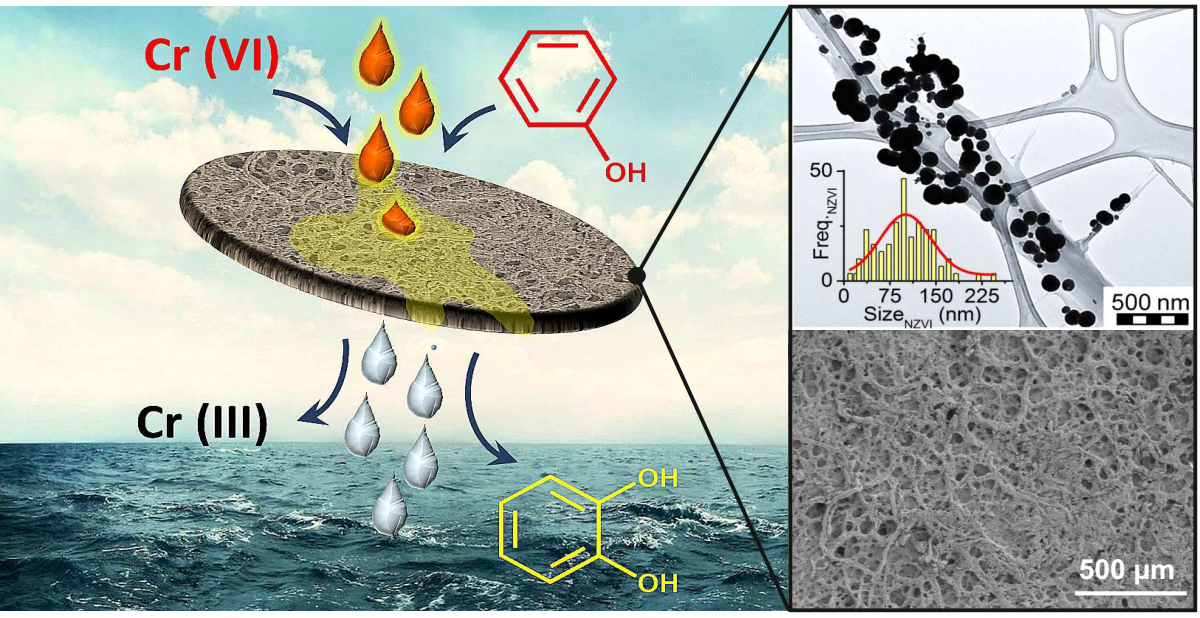
Example of patterned filters

CHARACTERISTICS OF Fe-FUNCTIONALIZED FILTRATION MATERIALS

> Patented technology* of fibre-filters functionalization
> Functionalization of any type of fibre filters/membranes
> Functionalized magnetic filters/membranes are highly-efficient for contaminant removal (metals, reducible organic compounds)
> Filters are air-stable and patternable upon request
> Possibility to combine reductive properties of Fe^0 nanoparticles with antimicrobial activity of Ag nanoparticles (i.e., bimetallic Ag-Fe functionalization)
> Loading of metal nanoparticles can be tailored to particular application
> Environmental friendly filtration technology
> Effective, affordable, sustainable filtration technology

EXAMPLE OF FILTER MODIFICATION

Fe^0 nanoparticles on cellulose filters forming magnetically active membrane hybrids, showing high activity towards the removal of Cr^{6+} and an excellent catalytic ability to convert phenols into catechol, by simple filtration processes.



* European Patent No. 14184322.7-1352
K. K. R. Datta, E. Petala, K. J. Datta, J. Perman, J. Tucek, P. Bartak, G. Zoppellaro, M. Otyepka, R. Zbořil, Chem. Commun., 2014, 50, 15673-15676

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