Advanced Plasma Technologies: Surface Treatment, Coatings, and Innovative Applications in Health, Agriculture and Liquid

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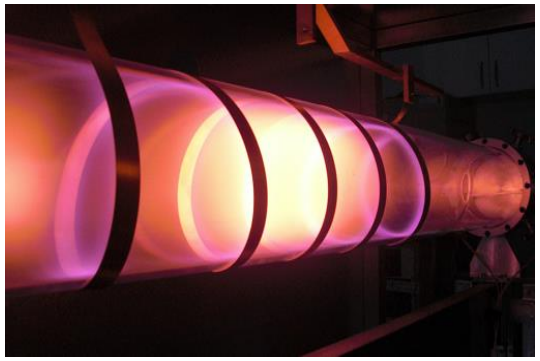
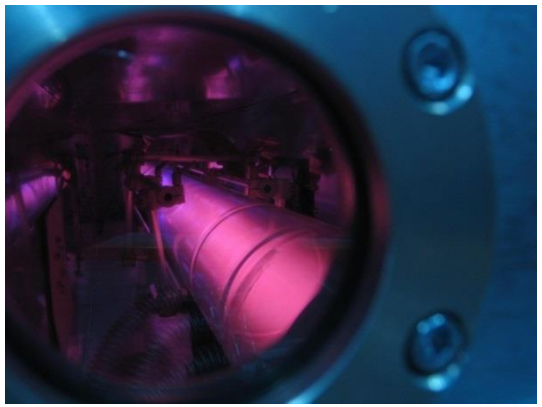
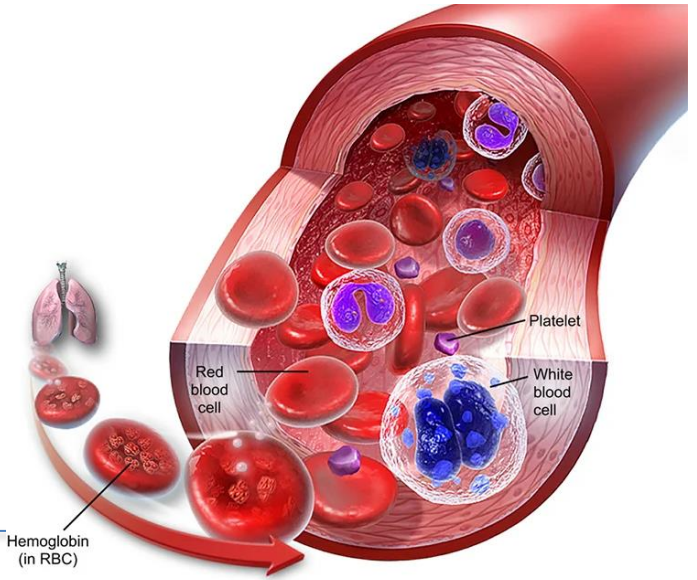




What is plasma?

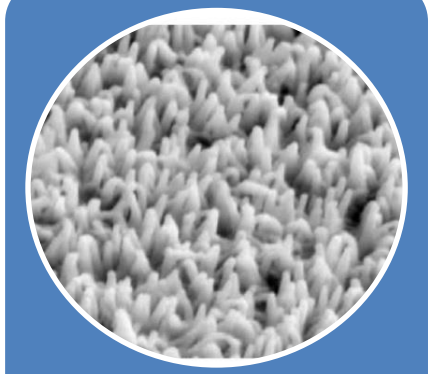
- Its a fourth state of matter and it includes neutral molecules as well as free electrons and positive ions.
- Plasma in high vacuum or at atmospheric pressure.
- Gases used for plasma are normally oxygen, air, nitrogen and argon.
- By fine tuning the plasma (temperature of atoms and ions, density of atoms and ions etc.) and discharge (type of gas used, flow, power, time etc.) parameters it is possible to create plasma for desired applications (cleaning, etching, sterilization etc).



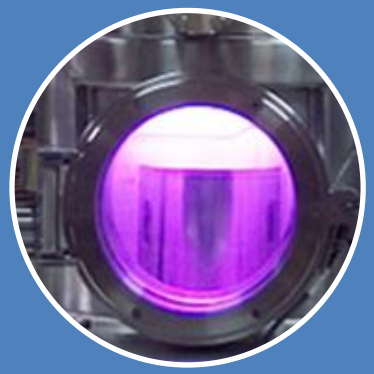
Surface modification

Removal of organic contaminants

Improve adhesion



Selective etching, nanostructuring

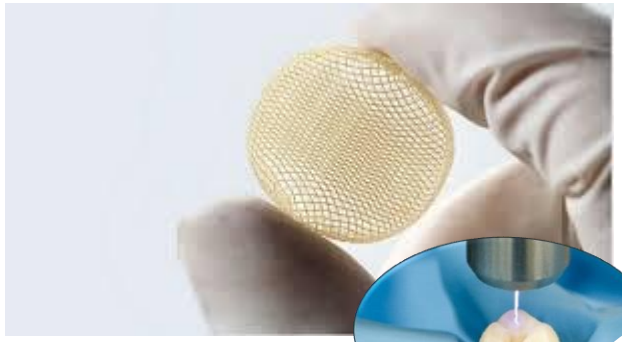


Coating

Decontamination

Plasma technologies

Plasma in industry



Research

Textile industry

Microelectronics

Plasma technologies

Medicine

Electro-industry

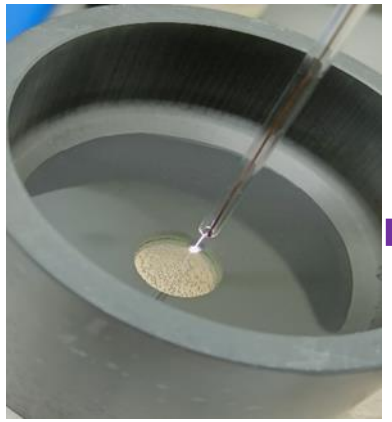
Agriculture

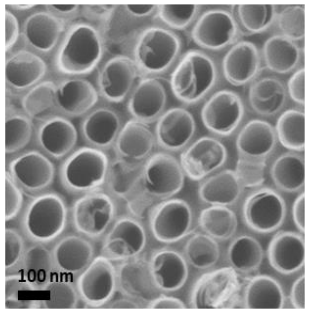
Car industry

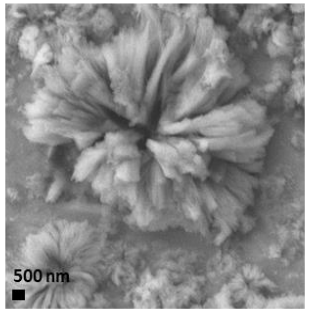
High:

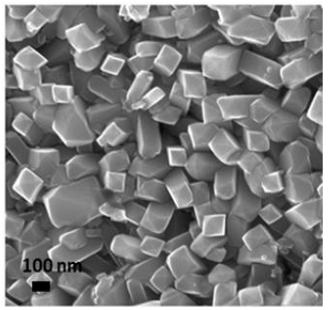
- interdisciplinarity
- innovation potential
- value added products

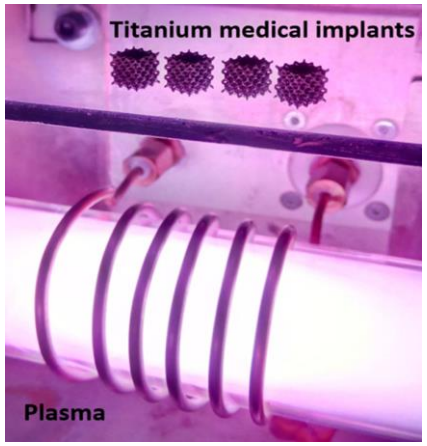
Material nanostructuring, funcionalization









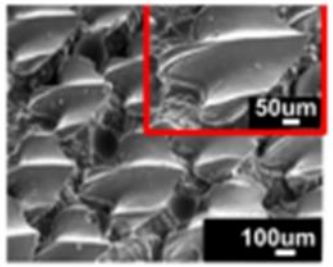


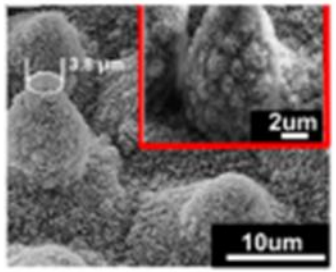
Biomimetic surfaces

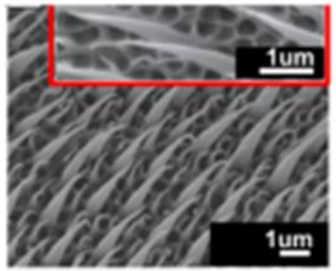

Shark skin


Lotus leaf


Gecko skin







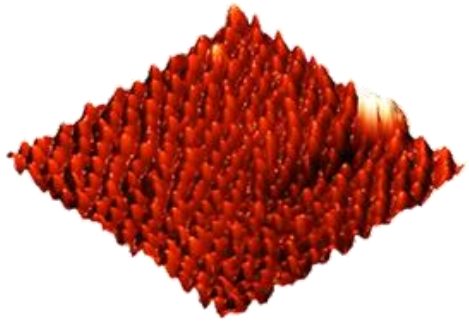
Additive manufacturing of custom made implants- surface finishing

- Improved biocompatibility
- Antibacterial
- High surface to volume ratio

Plasma in medicine

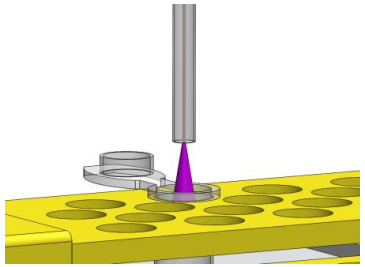
EP3185921B1 Method for treatment of tools and tools used for isolation of microvesicles, nanovesicles and exosomes

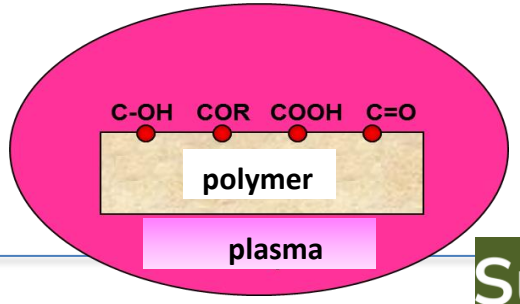
- surface nanostructuring



- increased hydrophilicity

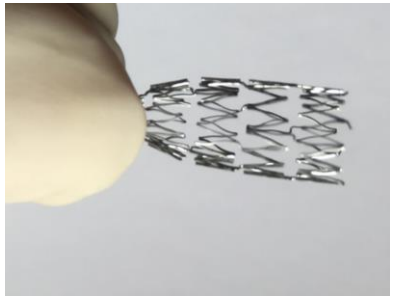
- functionalizing the surface





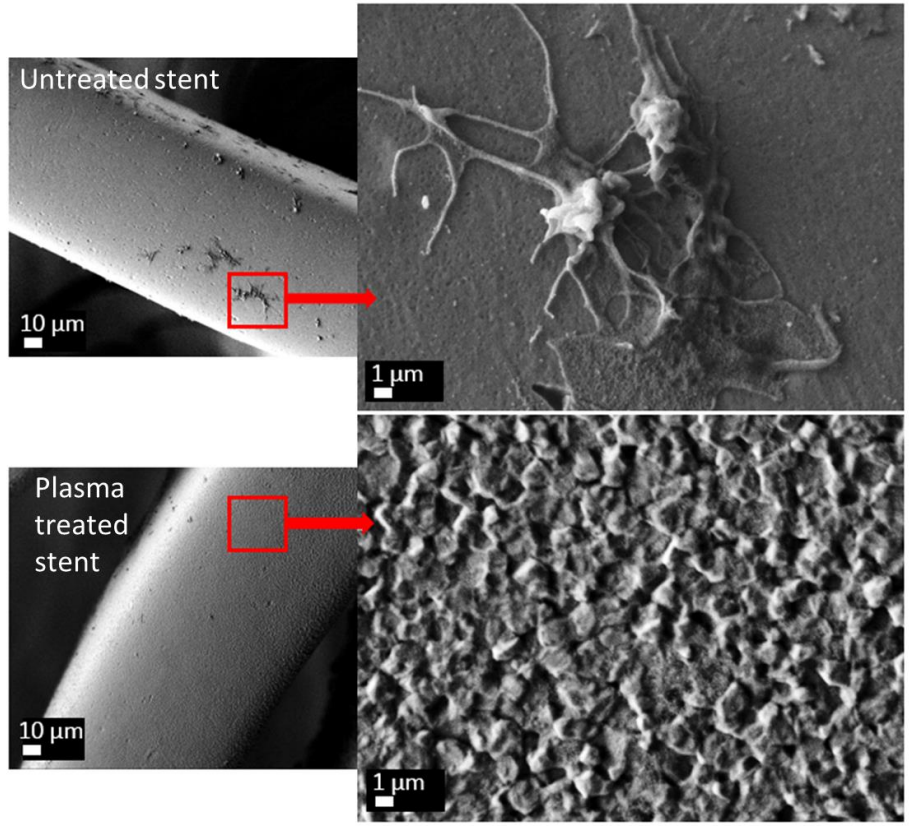
POLYMERS, NATURAL MATERIALS, METALS

Advanced vascular stents

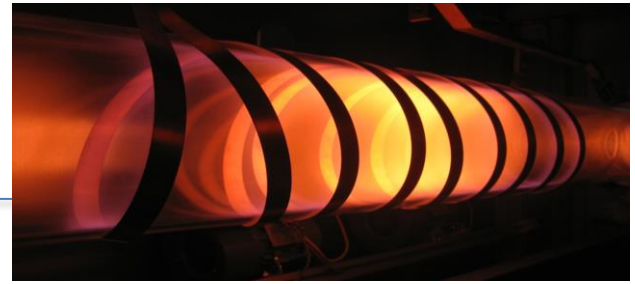


Advanced wound healing patch

US11208720B2 Method for treatment medical devices made from nickel-titanium (NiTi) alloys

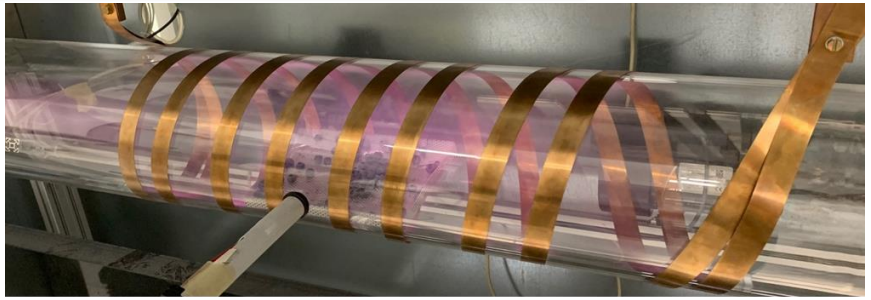


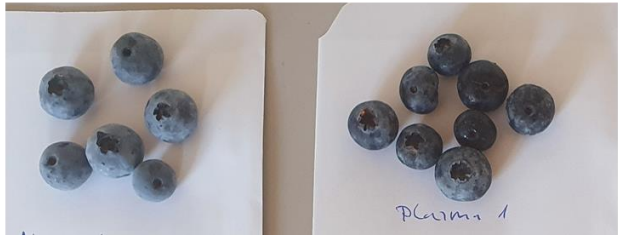
Innovative approaches



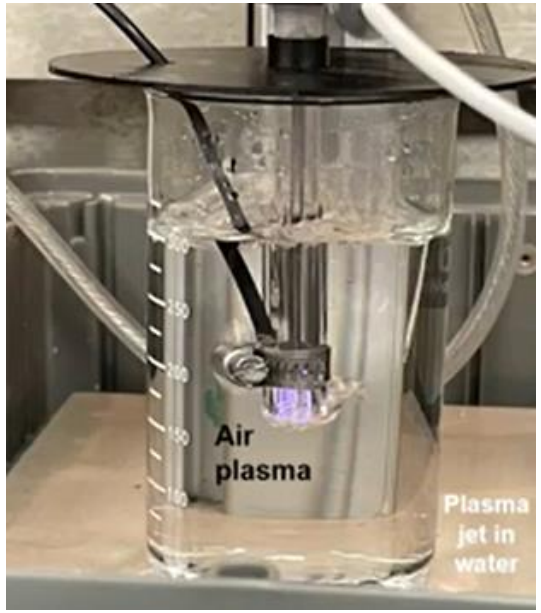
Plasma in agriculture

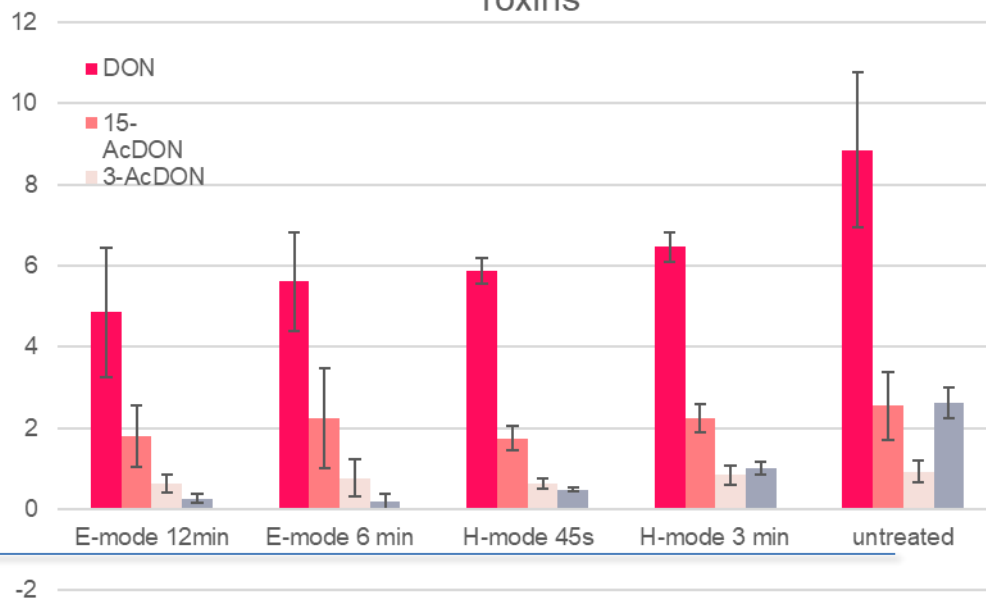
- Removal of natural toxins from seeds, fresh produce
- Increasing shelf-life
- Improving germination of seeds
- Plasma treatment of water, liquids
- Treatment of textiles for improved growth





- **Introduction of many species**
  - **Oxygen species**
    - O_3, $O^{\cdot}$, O^{-}, O_2^{+}, $O_2^{\cdot}$, O
  - **Nitrogen species**
    - N_2^{+}, NO, NO_2^{-}, NO_3^{-}, NH_3, NH_4, $N_2^{\cdot}$, N
  - **Water species**
    - OH, H_2O_2, $H3O^{+}$, H_2O^{+}, $OH^{\cdot}$, e^{-}





Needed support for innovative technologies/products

BOOSTING INOVATIVE POTENTIAL

- Legal and financial assistance for patenting
- Supporting licensing/commercialization
- Support innovative pilot/demonstrator projects from RO and SME/industry
- Grants for innovative SMEs
- Promoting innovations from RO with research grants

BOOSTING COLLABORATION

- Founding for interdisciplinary teams oriented in product development (TRL 4-9)
- Support industry oriented Masters, PhD and post doc grants- possibly interdisciplinary work- product oriented
- Beyond the patent: provide networking platforms and financial support

Thank you for your attention!

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CA19110 Plasma applications for smart and sustainable agriculture

PlasTHER – THERAPEUTICAL APPLICATIONS OF COLD PLASMAS

University Medical Centre Ljubljana

ekliptik