

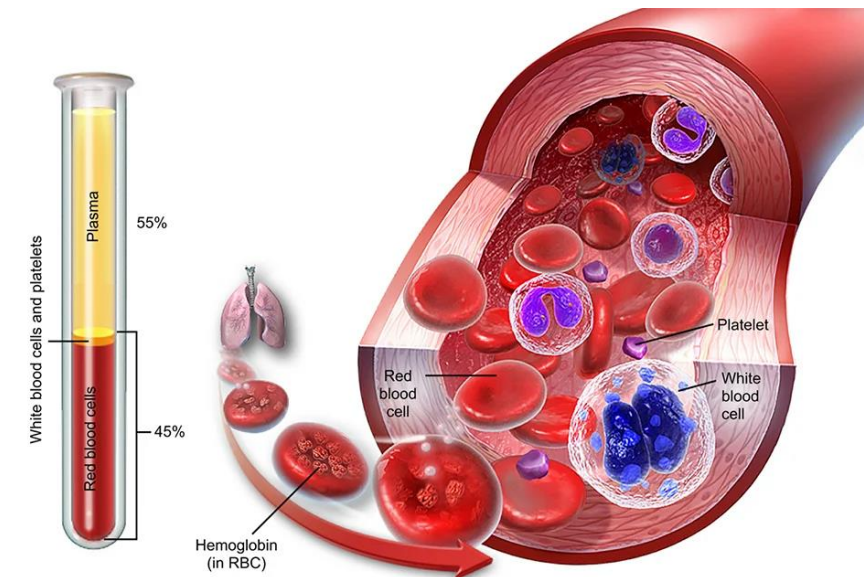
Advanced Plasma Technologies

Ita Junkar



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).**



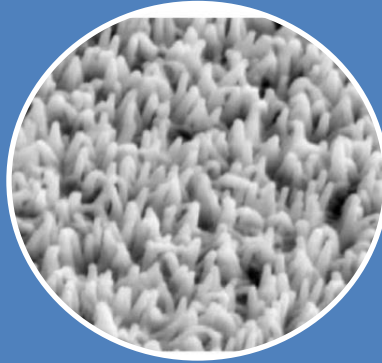
Surface modification



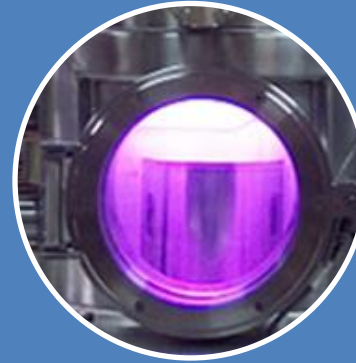
Removal of organic
contaminants



Improve adhesion



Selective etching,
nanostructuring



Coating



Decontamination



Plasma technologies

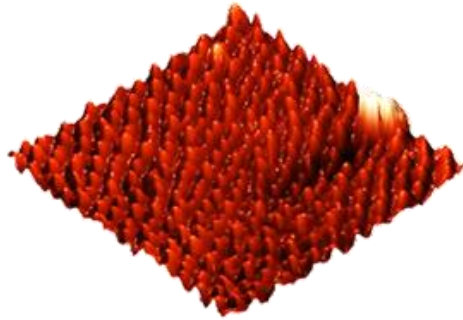
Plasma in medicine

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

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



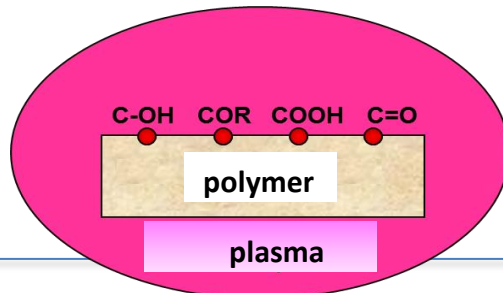
- surface nanostructuring



- increased hydrophilicity

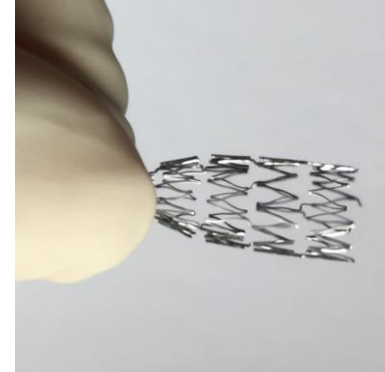


- functionalizing the surface

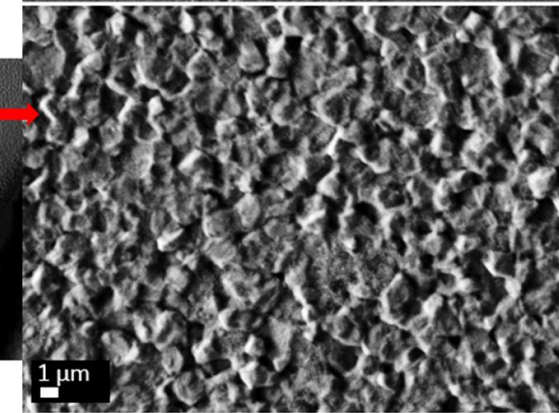
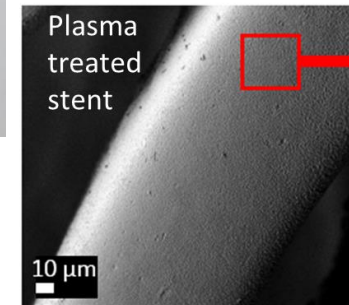
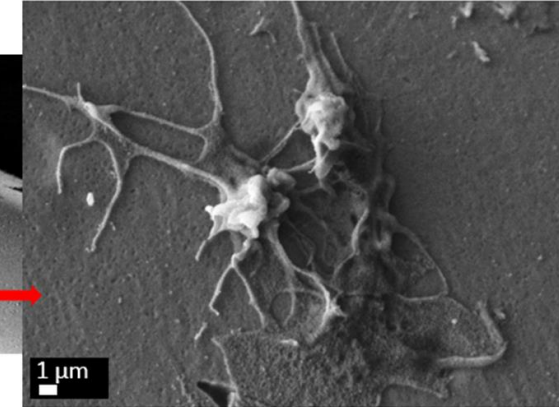
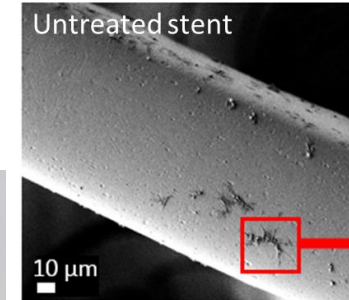


POLYMERS, NATURAL MATERIALS, METALS

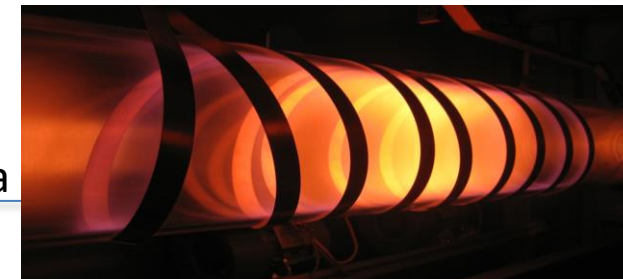
Vascular stents



Advanced wound healing patch

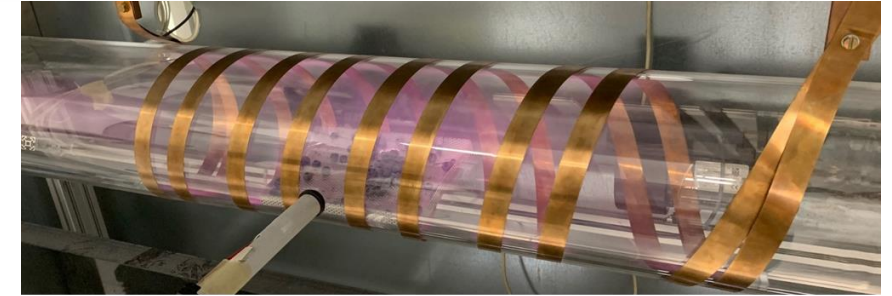


Combining hydrogen and oxygen plasma



Plasma in agriculture

- Removal of natural toxins from seeds, fresh produce
- Increasing shelf-life
- Improving germination of seeds
- Plasma treatment of water, liquids
- Fertilizers



Toxins

• Introduction of many species

• Oxygen species

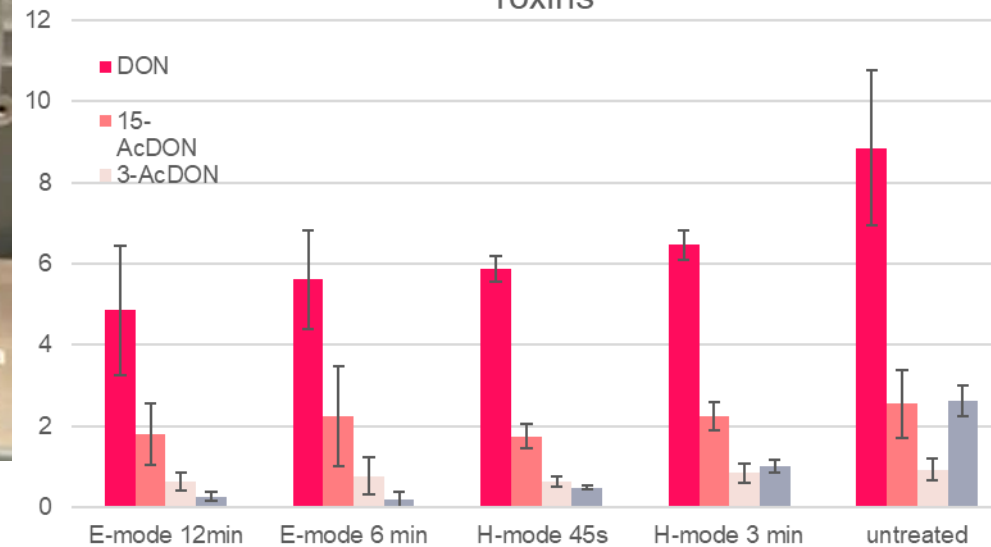
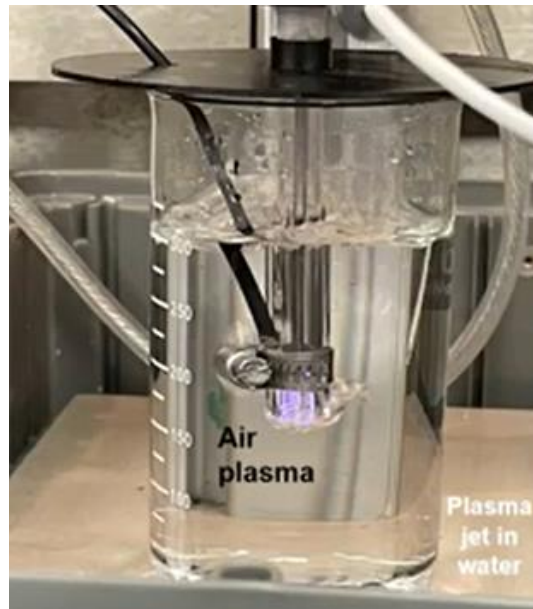
- O_3 , $O^\bullet$, O^- , $O_2^\bullet$, O_2^+ , O

• Nitrogen species

- $N_2^\bullet$, NO , $NO_2^\bullet$, $NO_3^\bullet$, NH_3 , NH_4 , $N_2^\bullet$, N

• Water species

- OH , H_2O_2 , H_3O^+ , H_2O^+ , $OH^\bullet$, e^-



Thank you for your attention.



ita.junkar@ijs.si



MEDNARODNA
PODIPLOMSKA ŠOLA
JOŽEFA STEFANA



Valdoltra
Arthroplasty Registry



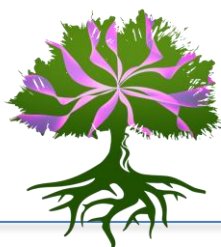
University of Ljubljana



REPUBLIKA SLOVENIJA
**MINISTRSTVO ZA KMETIJSTVO,
GOZDARSTVO IN PREHRANO**



Slovenian Research and Innovation Agency



CA19110
Plasma applications
for smart and
sustainable agriculture



University Medical
Centre Ljubljana



ekliptik