Functionalization of PVDF membranes for improved polymer–membrane interface

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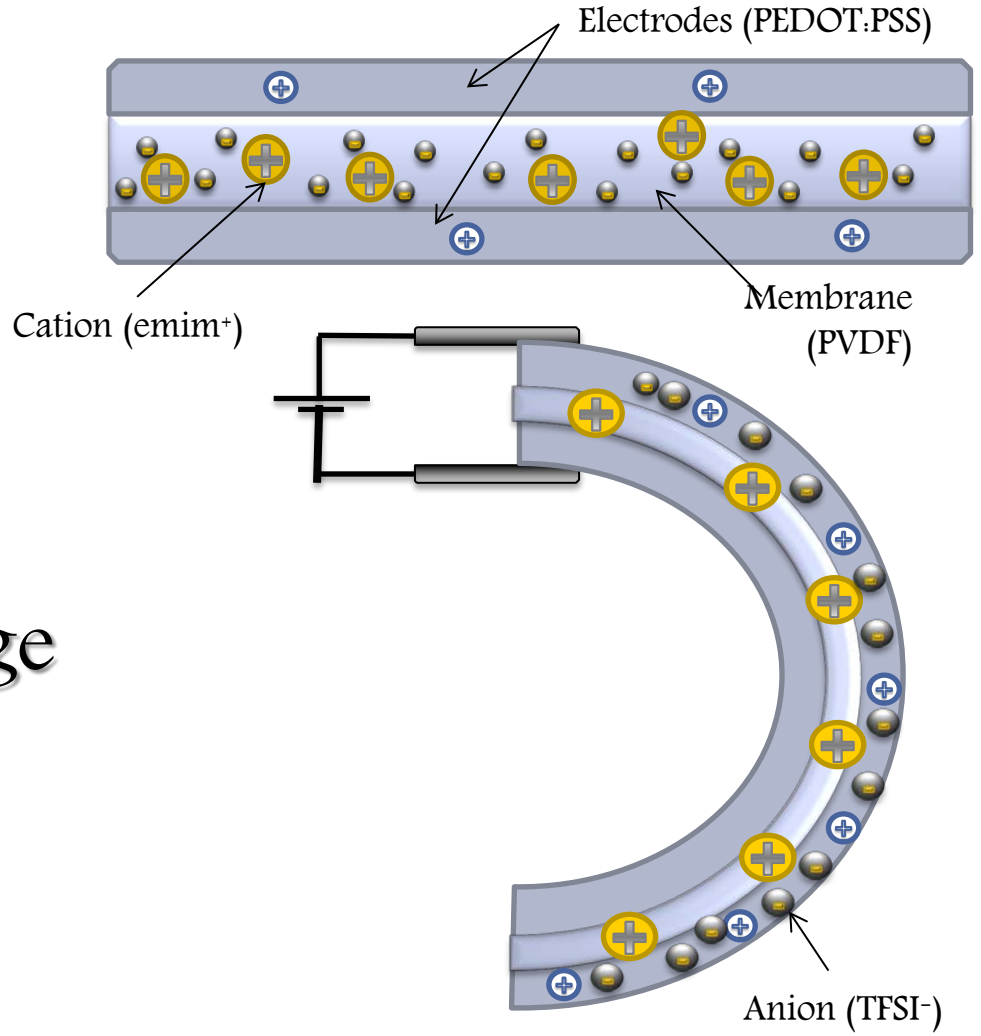
Conducting polymer actuators

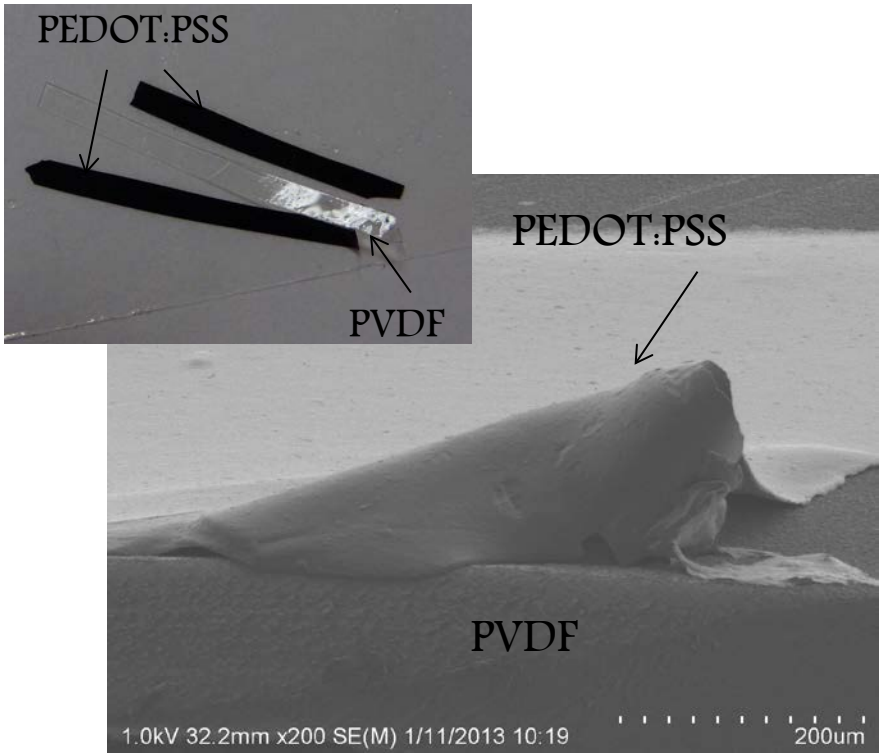
Ionic EAPs (through the diffusion of ions)

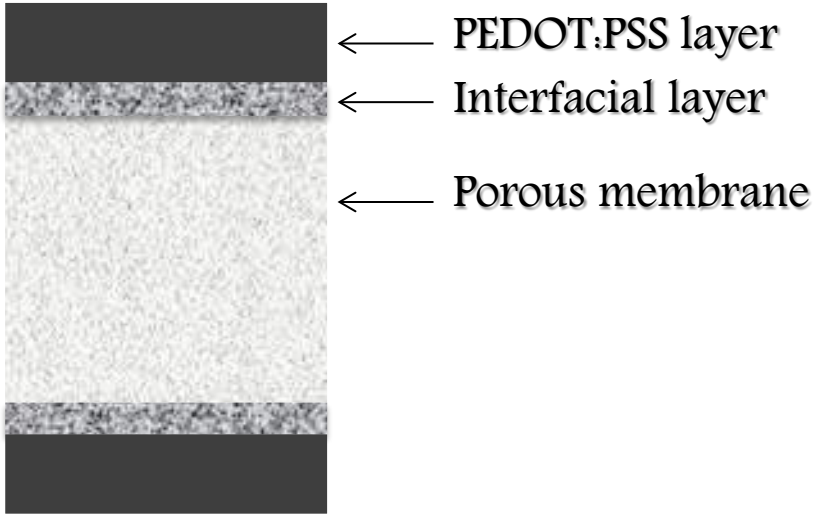
- Low actuation forces
- Electrolyte required
- Slow
- Low driving voltage
- Large bending
- Bi-directional



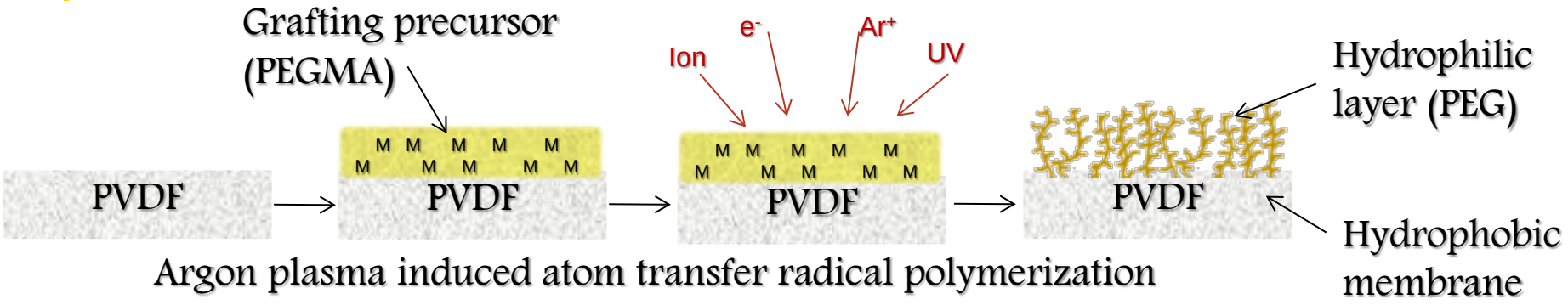
Conducting polymer actuators

Delamination of the electrode polymer from the membrane due to stresses at the interface



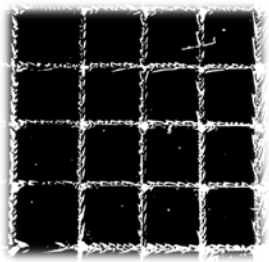


Functionalization of PVDF membranes



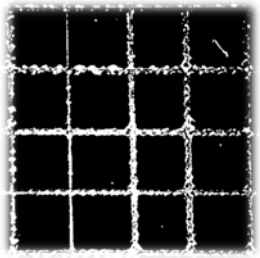
Argon plasma induced atom transfer radical polymerization

PEDOT/PSS on pristine PVDF membrane

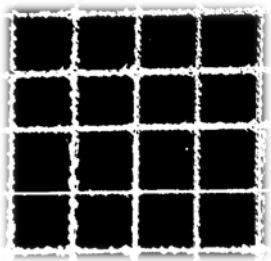


Adhesion test (x5)

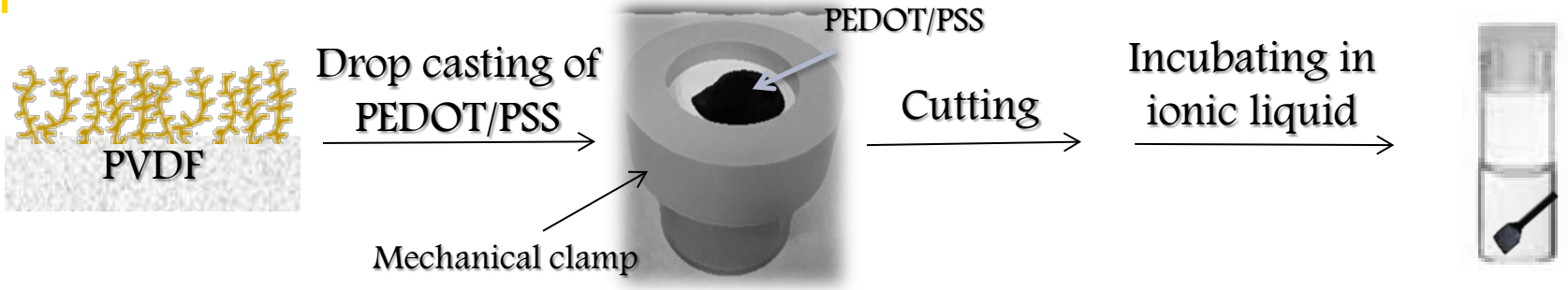
PEDOT/PSS on functionalized PVDF membrane

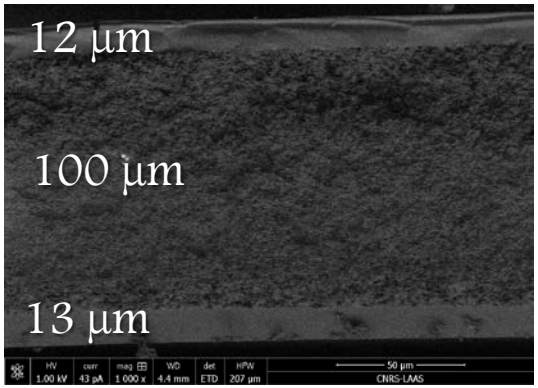


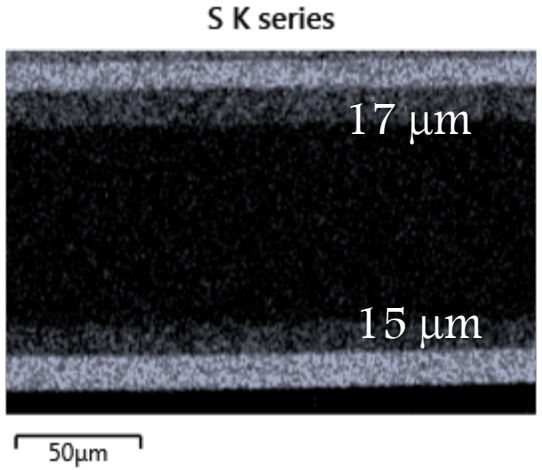
Adhesion test (x5)

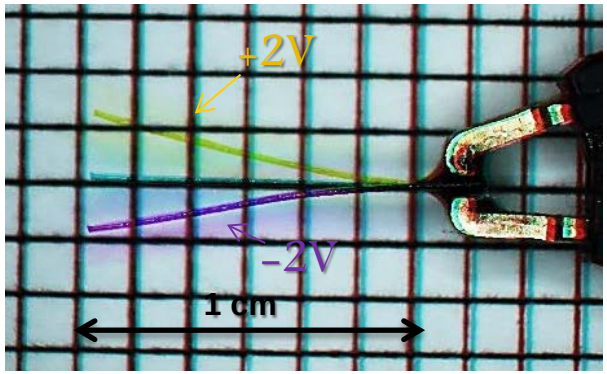


Fabrication of trilayer actuators









Grafting of PEG on the surface of PVDF improves adhesion strength between PVDF membrane and PEDOT/PSS electrodes and allows fabrication of trilayer actuators without short circuits

In the future…

- Control of grafting depth and penetration
- Caracterisation of actuation and cycle-life

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- Ink-jet printed devices
- ‘Kirigami’ and design of other than bending movements
- Closed-loop control

THANK YOU