Towards the development of an electric organ to power artificial muscles

Carolina Pierucci[1,2], Marco Rojas Cessa[2], Nick Zahnd[1], Michael Mayer[1,2], Alessandro Ianiro[1,2]

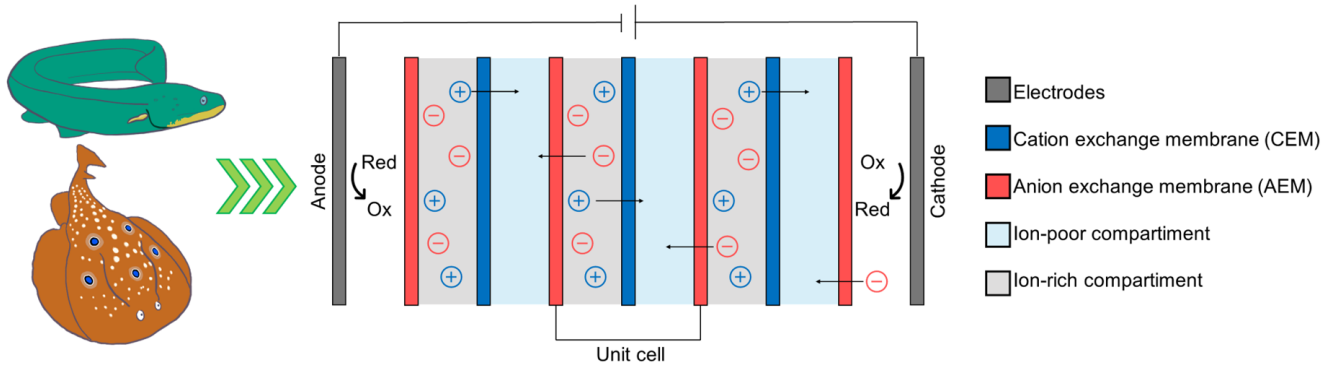
[1]Adolphe Merkle Institute, University of Fribourg, Chemin des Verdiers 4, Fribourg 1700, Switzerland.

[2]Swiss National Center for Competence in Research (NCCR) Bio-inspired Materials, University of Fribourg, Chemin des Verdiers 4, Fribourg 1700, Switzerland.
carolina.pierucci@unifr.ch

Fish such as Torpedo rays and Electric eels have evolved the ability to transform metabolic energy into powerful electrical discharges. Inspired by this natural phenomenon, we are developing implantable artificial electric organs capable of powering active devices such as artificial muscles and pacemakers.

We are currently exploring three main strategies:

- constructing reverse electrodialysis (RED) systems using hydrogels[1],
- utilizing commercial proton exchange membranes like Nafion[2],
- and fabricating ultrathin membranes through the self-assembly of amphiphilic block copolymers (BCPs)[3].



Preliminary results show that all three approaches can successfully generate compact and efficient artificial electric organs at a small scale. As we continue refining these systems, we believe they could significantly impact future technologies in active prosthetics, soft robotics, and energy-autonomous biomedical devices.

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