

SELECTIVE ION TRANSPORT IN GRAPHENE OXIDE MEMBRANES AND CARTRIDGES

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State of the art

- 2D-materials can act as nanometric sieves for ions.
- Ions can travel on long distances (cm-scale) in between graphene oxide (GO) nanosheets.
- Selective transport of anions and cations already demonstrated¹.

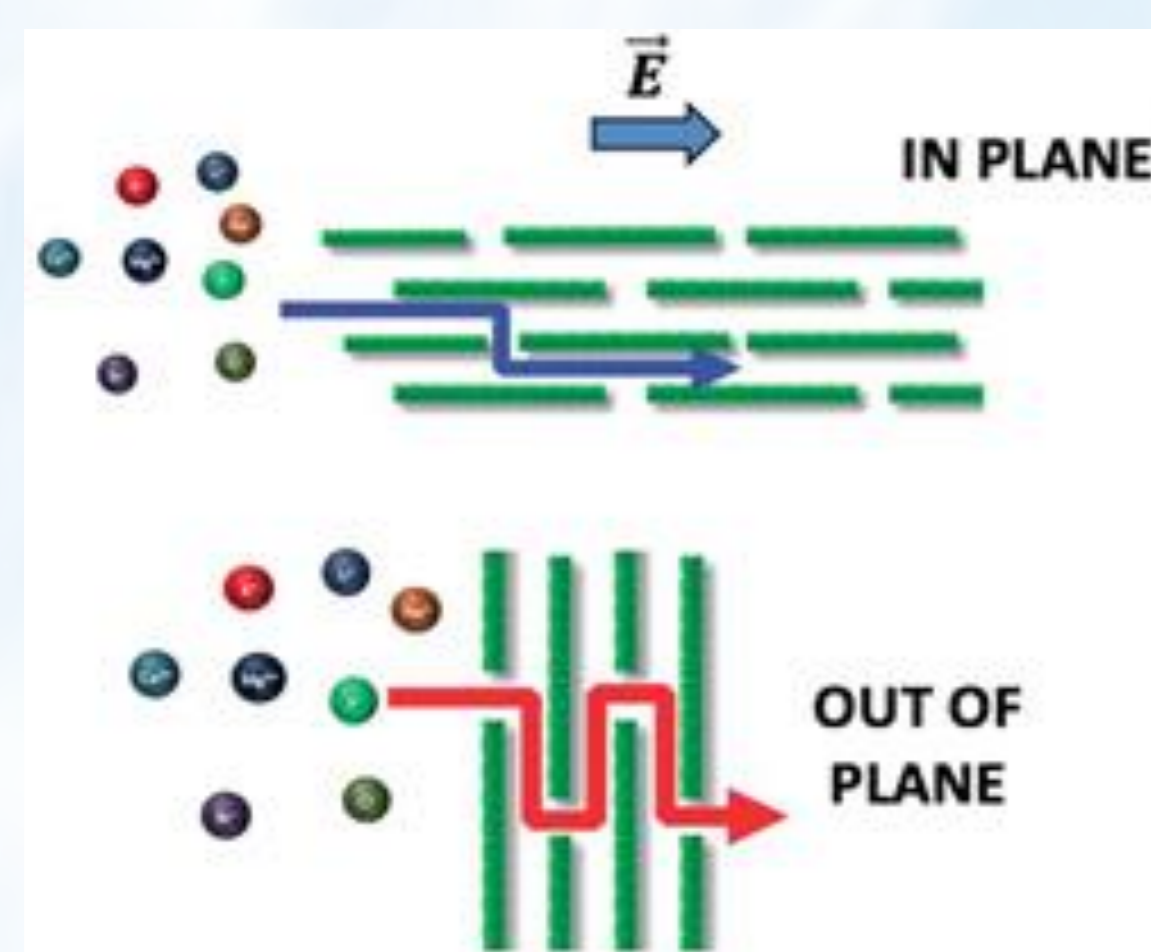


Figure 1. In plane (IP) and out of plane (OOP) ion transport in macroscopic GO membranes

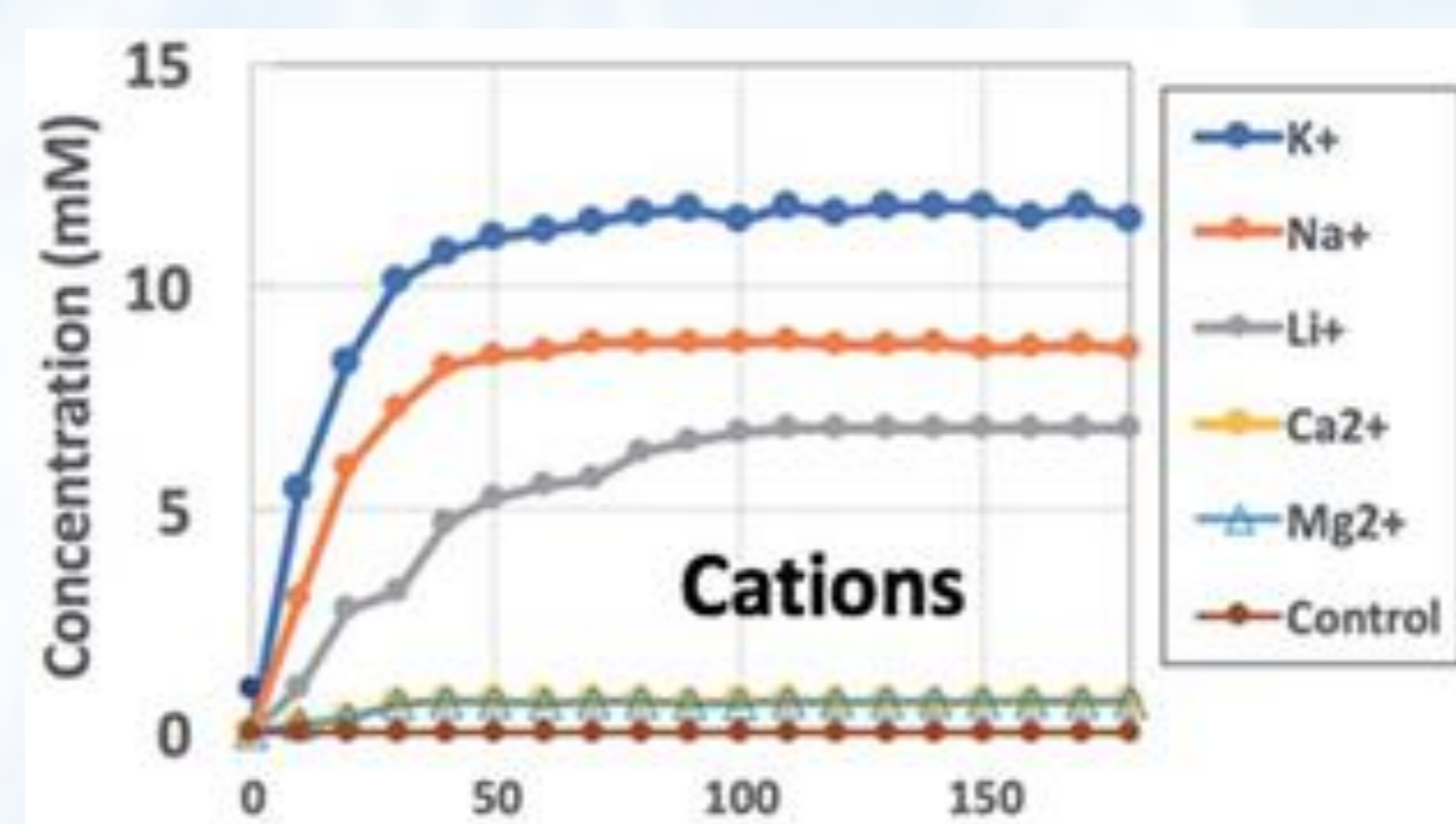


Figure 2. Selective ion transport in GO on centimeter-scale from our previous work¹.

Filter geometry

- Nanofiltration usually done on flat substrates.
- We deposit GO on industrial filters, made of tens of hollow micro-fibers (200 μm)
- The geometry allows to have a larger active filter area and higher throughput^{2,3}.



Figure 4. (a) Polyethersulfone Hollow fibers (HF, Versatile PES®), (b) Versatile PES® filtration module (Plasmart 100)

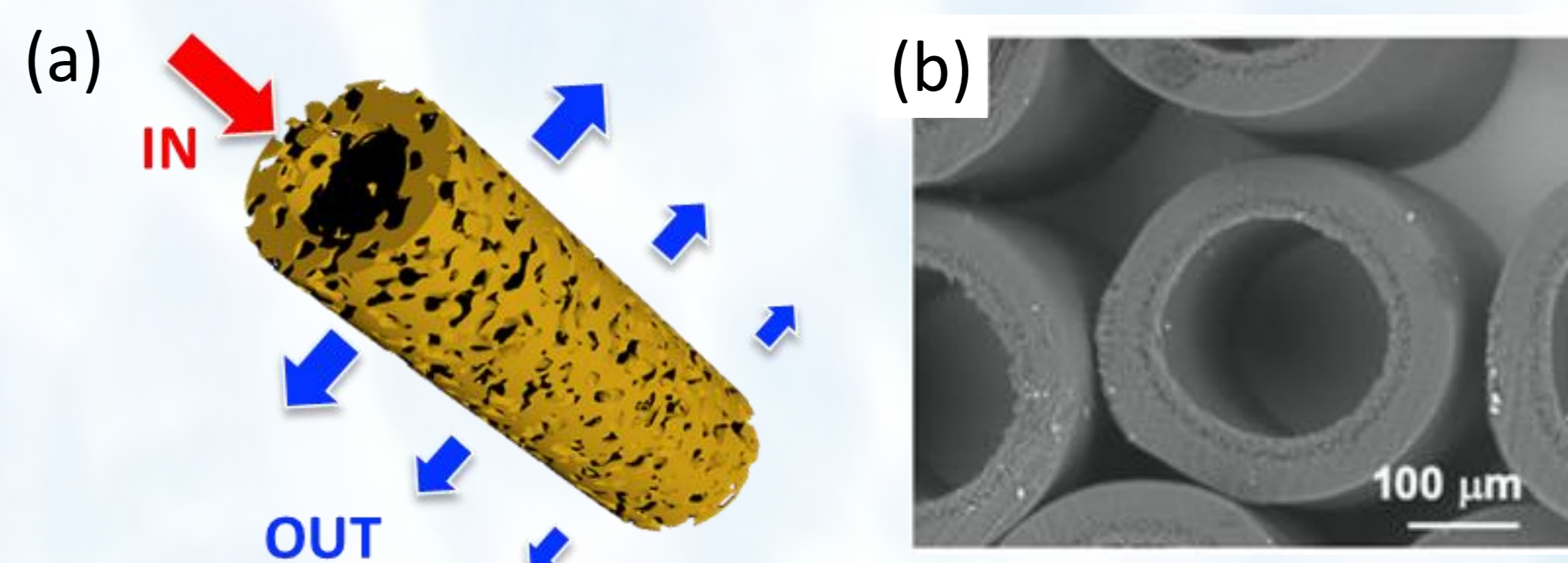


Figure 5. (a) ion movement inside a fiber, (b) SEM cross section of the fibers.

Electro-migration set up

- Constant potential applied on opposite input and output of the filter (electrode A and electrode B).
- Ion migration monitored by electrochemical impedance spectroscopy (EIS) and atomic adsorption spectroscopy (AAS).

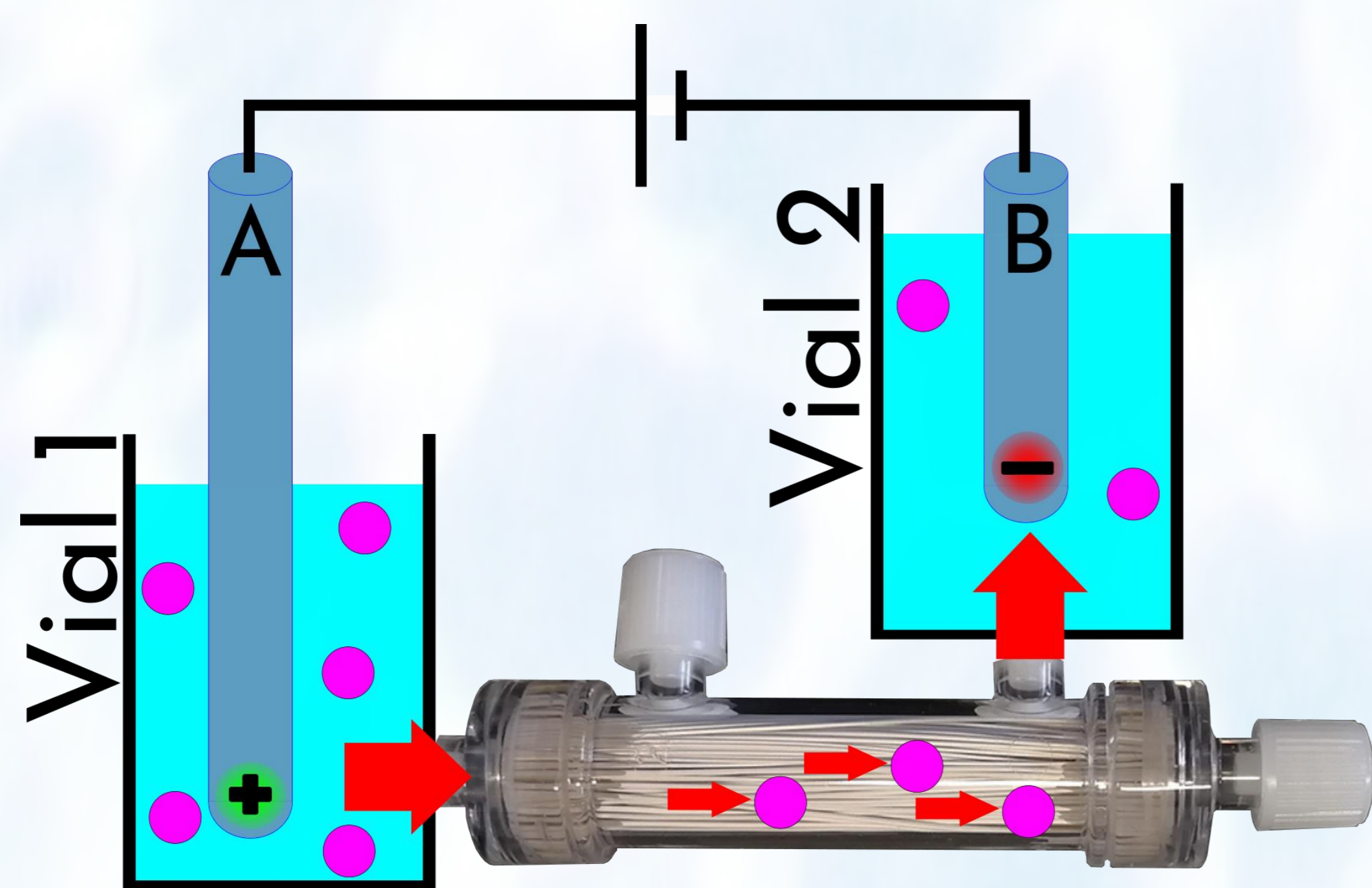


Figure 6. Instrumental set-up used for the ion transport, ions moved by an electric field in a cartridge.

Preliminary Results

- The increase in VIAL 2 conductivity (Λ) is due to the transport of ions through the GO.
- Na^+ can migrate better than Ca^{2+} inside the GO.
- Selectivity of ions transported seems to increase with % GO loading.

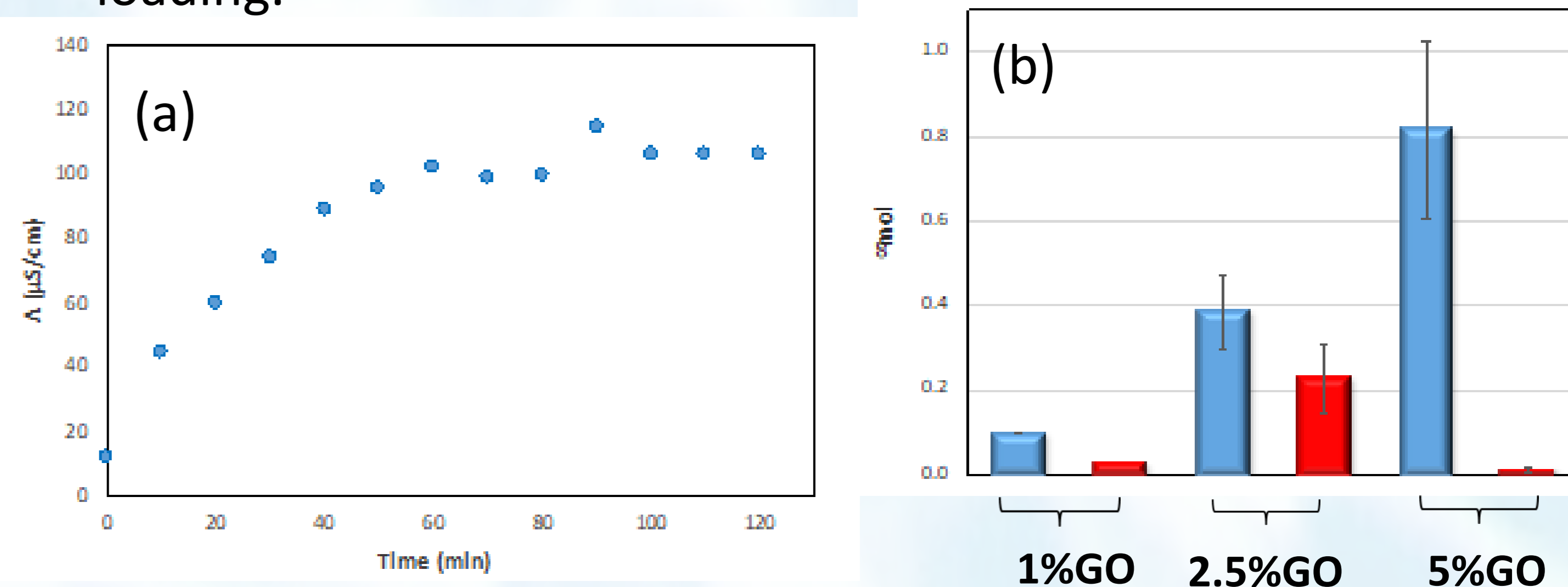


Figure 7. (a) trend of the conductivity (Λ) of the solution in vial 2 vs. time, (b) Na^+ (blue) and Ca^{2+} (red) transported at different GO loading in the filter.