MONOGRAIN MEMBRANES AS ARTIFICIAL THYLAKOID MEMBRANES

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Artificial Photosynthesis is understood here as the design of an artificial structure to allow hydrogen (or reducing agents such as ATP or hydrocarbons) and oxygen production from water by solar illumination [1]. In order to prevent back reactions the two reactions water reduction and water oxidation should happen in separate compartment preferentially separated by an artificial structure mimicking e.g. the thylakoid membrane in chloroplasts (in algae and plants) and in cyanobacteria.

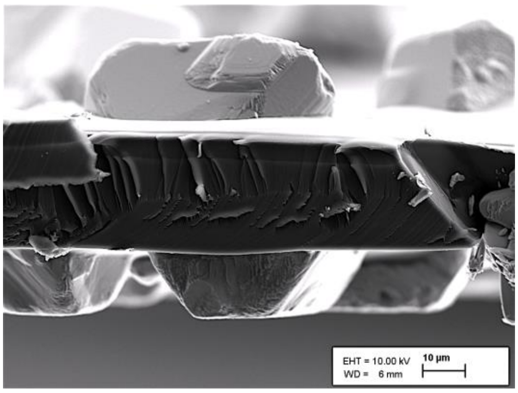

Fig.1 CZTS monograin membrane

Here we report on a completely new type of ionically conductive Monograin Membranes [2] made from composites of polymers in a way, in which the ionic conductivity is provided by proton conductive channels at the monograin membrane interface. This enables proton flux just parallel to the charge flow as in the pores provided by ATP synthase. This ionic transport on the shortest possible pathway provides the lowest possible ionic resistance even in electrolytes with very low conductivity.

These channels open upon activation [3], i.e. the drag of water molecules into the pores by protons during current flow after a sufficient voltage is applied across the membrane, leading to a stepwise increase of current with time.

References

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3. R. Hiesgen, et al, 2013, Atomic force microscopy studies of conductive nanostructures in solid polymer electrolytes, Electrochimia Acta 110, 292-305.

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