# Sunlight-driven Ion pump for use in Solar Photo-dialysis Technology

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## OTHER INFORMATION

## KEYWORDS

Proton pump, Ion pump, Solar desalination, Photoacids, Photo-dialysis, bacteriorhodopsin, excited-state proton transfer

## CATEGORIZED AS

- **Biotechnology**
  - Health
- **Energy**
  - Solar
- **Materials & Chemicals**
  - Polymers

## RELATED CASES

2017-190-0

## BRIEF DESCRIPTION

The invention is a specialized membrane that absorbs solar energy to directly drive desalination of salt water. Compared to state of the art devices, the invention is capable of bypassing the inefficient conversion from electronic energy to ionic energy, saving up to 85% of the energy required by other state of the art electrodialysis cells.

## FULL DESCRIPTION

Potable water is a universal human need. Desalination is an important tool for creating potable water from salt water sources, either in regions that lack sufficient freshwater sources or for disaster relief. Current desalination technologies are expensive and inefficient, even on large scale. State of the art solar-driven electrodialysis cells use 5 times the minimum energy required by thermodynamics. Traditionally, a solar cell is separately used to generate electricity which is in turn used to power an electrodialysis cell. This involves inefficiencies in both the electricity generation and powering of the cell.

The inventors at UCI have developed an integrated solar electrodialysis device which is driven directly by sunlight. The device uses a photoacid-dye-functionalized membrane to drive ions through separate filters, leaving behind salt-free water. The process much more efficient than separate solar and electrodialysis cells, using up to 85% less energy.

## SUGGESTED USES

Desalination

Integrated Solar Photo-Dialysis

## ADVANTAGES

The electrodialysis cell is powered directly by the sunlight, using >85% less energy than other state of the art solar-driven electrodialysis cells

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| United States Of America | Issued Patent | 11,318,424 | 05/03/2022 | 2017-190 |

## STATE OF DEVELOPMENT

The inventors have experimentally verified power generation from a light-absorbing ion exchange membrane (the major technical hurdle) and have numerically modeled the complete dialysis cell.

## RELATED MATERIALS

» Energy Sciences at the Molecule–Material Interface - 03/23/2017

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