What is the new energy battery osmotic membrane

Can a semipermeable membrane convert osmotic energy to electricity?
Researchers in ACS Energy Letters report creating a semipermeable membrane that harvests osmotic energy from salt gradients and converts it to electricity. The new design had an output power density more than two times higher than commercial membranes in lab demonstrations.

What is osmotic power?
Osmotic power,salinity gradient power or blue energy is the energy available from the difference in the salt concentration between seawater and river water. Two practical methods for this are reverse electrodialysis (RED) and pressure retarded osmosis (PRO). Both processes rely on osmosis with membranes. The key waste product is brackish water.

How does a membrane improve osmotic power?
An improved membrane (yellow line) dramatically increased the amount of osmotic power harvested from salt gradients, like those found in estuaries where salt water (left tank) meets fresh water (right tank). Credit: Adapted from ACS Energy Letters 2024, DOI: 10.1021/acsenergylett.4c00320

How does a salt water membrane improve osmotic power?
The new design had an output power density more than two times higher than commercial membranes in lab demonstrations. An improved membrane (yellow line) dramatically increased the amount of osmotic power harvested from salt gradients, like those found in estuaries where salt water (left tank) meets fresh water (right tank).

Where can osmotic energy be generated?
Osmotic energy can be generated anywhere salt gradients are found,but the available technologies to capture this renewable energy have room for improvement. One method uses an array of reverse electrodialysis (RED) membranes that act as a sort of "salt battery," generating electricity from pressure differences caused by the salt gradient.

How does a nanofluidic membrane improve osmotic energy?
The advanced membrane significantly boosted the osmotic energy extracted from salt gradients, such as those found in estuaries where fresh and saltwater mix. The Chinese team used a unique nanofluidic membrane with multiple layers.

OverviewMethodsBasics of salinity gradient powerEfficiencyPossible negative environmental impactSee alsoExternal linksWhile the mechanics and concepts of salinity gradient power are still being studied, the power source has been implemented in several different locations. Most of these are experimental, but thus far they have been predominantly successful. The various companies that have utilized this power have also done

so in many different ways as there are several concepts and processes that h...

For the integrated utilization of thermal energy and higher power output performance, we demonstrate thermoenhanced osmotic energy conversion by employing highly soluble lithium bromide...

In the journal ACS Energy Letters, researchers report creating a semipermeable membrane that harvests osmotic energy from salt gradients and converts it to electricity. The new design had an output power density more ...

These new membranes have also demonstrated an ability to effectively harvest osmotic energy (with power output ranging from 6 to 38 W/m 2) by applied pressure in the ...

Osmotic battery (OB), alternating the operation of reverse osmosis (RO) for charging and pressure-retarded osmosis (PRO) for discharging, is an emerging grid-scale energy storage ...

Researchers have developed a system that generates electricity from osmosis with unparalleled efficiency. Their work uses seawater, fresh water, and a new type of ...

Researchers have created a semipermeable membrane that generates electricity by absorbing osmotic energy from salt gradients. The advanced membrane significantly boosted the osmotic...

Osmosis breakthrough: New battery uses river salt to generate electricity. Salt battery outperforms commercial RED membrane: 2.34x higher output power density, runs continuously for 16 days.

Nanofluidic membranes have demonstrated great potential in harvesting osmotic energy. However, the output power densities are usually hampered by insufficient membrane permselectivity. Herein, we ...

For the integrated utilization of thermal energy and higher power output performance, we demonstrate thermoenhanced osmotic energy conversion by employing ...

Scientists have created an innovative membrane that can generate renewable energy by harnessing the power of salt, according to findings published in the journal ACS Energy Letters. This breakthrough technology could help us tap into a vast new source of clean power right where rivers meet the sea.

As an osmotic energy generator, CG-SPEEK membrane achieves an impressive output power density of 9.2 W m -2 and exhibits ultrahigh cation selectivity (0.99), with an energy conversion efficiency of 48% at a 50-fold NaCl concentration gradient. The results highlight the ion diode effects of CG-SPEEK, driven by a charge density gradient that accelerates cation ...

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