Hydrogen production by PEM electrolysis
## Background

### Hydrogen society

Hydrogen society: Society that makes hydrogen the main energy source, and uses it.

### Advantage

- Hydrogen is an energy source of the **zero emission** at use and the consumption stage, and it is possible to **contribute to the environmental solution**.
- The **energy problem** can be cleared, and the **sustainable society** be established.

### Problem

- Development and practical use of **hydrogen technology** (fuel cell etc.).
- Improvement of economics.
- Infrastructure maintenance.
- Manufacturing of hydrogen from **renewable energy**.
## Background

<table>
<thead>
<tr>
<th>Feature of hydrogen</th>
<th>Fault</th>
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<tbody>
<tr>
<td><strong>Advantage</strong></td>
<td><strong>Fault</strong></td>
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<tr>
<td>・The raw material is unlimited (water or organism).</td>
<td>・It is very difficult to liquefy (-253[℃]).</td>
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<td>・Only water is generated when burning.</td>
<td>・A small-scale storing and transportation are more difficult than another fuel.</td>
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<tr>
<td>・A large-scale storing and transportation are easier than the electric power.</td>
<td>・It is necessary to manufacture a large amount of hydrogen because the reasonable amount cannot be secured.</td>
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<td>・It is generable from renewable energy.</td>
<td>・The related technology is immature.</td>
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The one that it is possible to become either (advantage and fault)

・It is possible to use it for the hydrogen engine though danger of exploding because of the broad range of combustion.
・The combustion temperature is high (3000℃). There is a possibility of generating NOx while big energy is generated.
・It goes into a metallic lattice because the molecule is extremely small and causes hydrogen embrittlement. But, using this character, the metal hydride is thought.
Purpose

Improvement of hydrogen generation efficiency by PEM electrolysis.

PEM electrolysis cell & equipment in surrounding

PEM electrolysis cell
Water is supplied to the anode side.  
2. The voltage is applied to two poles by the electronic load control device.  
3. Water is resolved on the anode.  
4. The hydrogen ion (proton) passes the electrolyte membrane, and it moves to the cathode side.  
5. The hydrogen ion receives the electron on the cathode side, and it becomes a hydrogen molecule.
• It is almost the same as the fuel cell structurally.
• At the current stage, the main research object is a porous body.