DTU Energy Conversion
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Anion conducting polymer membranes for hydrogen production through alkaline water electrolysis

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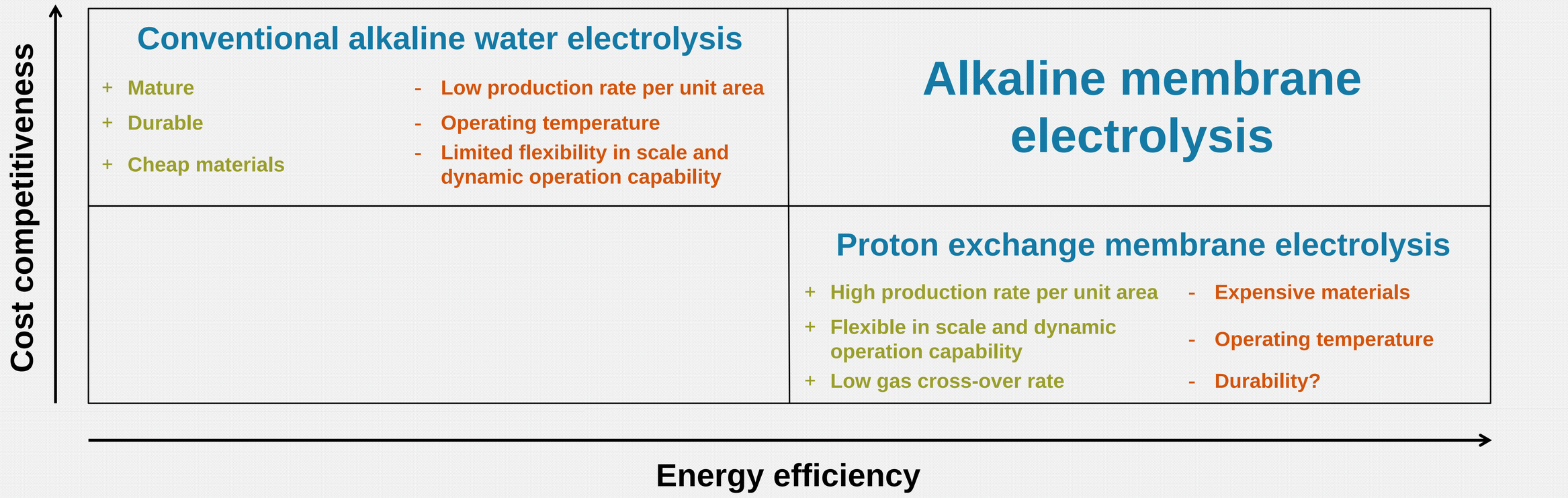
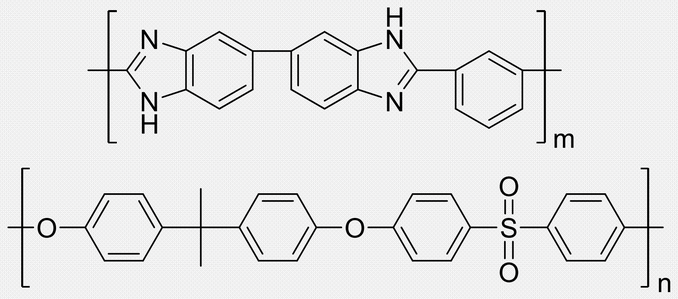
Introduction

Alkaline water electrolysis using asbestos diaphragms is a mature technology that has been used for hydrogen and oxygen production on a commercial scale since the 1920s [1]. The proton exchange membrane based water electrolysis systems, on the other hand, were developed after the first perfluorosulfonic acid membranes were launched about 30 years ago [2]. The two well established technologies have different advantages and drawbacks as summarized in the figure below. The aim of this recently started project is to, in collaboration with industrial and academic partners, develop novel anion conducting materials as electrode separators for alkaline water electrolysis. The target is to combine the corresponding advantages of the already established water electrolysis technologies to give a system with a combination of high energy efficiency and good cost competitiveness.



Technological approach

A limited number of alternative inorganic and organic materials have previously been investigated as electrode separators for alkaline water electrolysis. These include for example zirconia, potassium titanate, polyantimonic acid, polysulfones, polyphenylene sulfides, polytetrafluoroethylene and polybenzimidazoles [3]. The technological approach of the present project and examples of materials that will be considered are summarized schematically below.

Organic materials	Modifications	Inorganic materials	
	Crosslinking Copolymers Multi-component systems Porous structures	TiO_2 ZrO_2 Al_2O_3	**Membrane fabrication** **Characterization** **Electrolysis testing**

References

[1] R.L. LeRoy *Int. J. Hydrogen Energy* **1983**, 8, 401-417.
[2] P.W.T. Lu and S. Srinivasan *J. Appl. Electrochem.* **1979**, 9, 269-283.
[3] R. Renaud and R.L. LeRoy *Int. J. Hydrogen Energy* **1982**, 7, 155-166.

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