



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Development of new a material for sea water substructures by seawater electrolysis

Bjørgård, Trine Larsen; Margheritini, Lucia; Simonsen, Morten Enggrob

Creative Commons License
Unspecified

Publication date:
2018

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Bjørgård, T. L., Margheritini, L., & Simonsen, M. E. (2018). *Development of new a material for sea water substructures by seawater electrolysis*. Poster presented at Energiens Folkemøde, Esbjerg, Denmark.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- ? Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- ? You may not further distribute the material or use it for any profit-making activity or commercial gain
- ? You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Trine L. Bjørgård¹, Lucia Margheritini², Morten E. Simonsen¹

¹Aalborg University, Department of Chemistry and Bioscience, Esbjerg, Denmark. tlb@bio.aau.dk; mes@bio.aau.dk

²Aalborg University, Department of Civil Engineering, Aalborg, Denmark



01

A NEW, INNOVATIVE MATERIAL

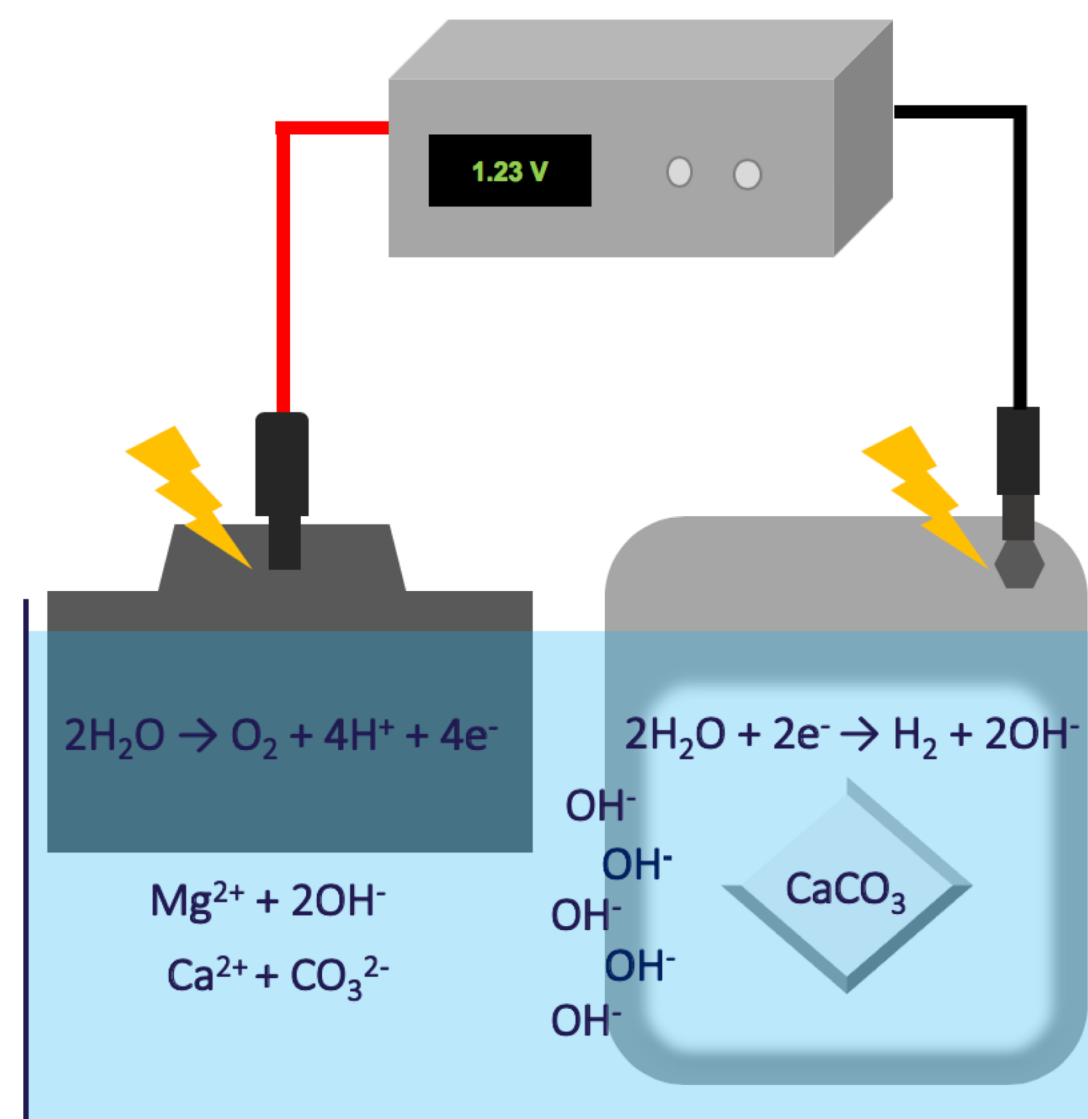
The aim of this study is to investigate the applicability of a material made by seawater electrolysis as a subsea **construction material** for green offshore energy structures.



INTRODUCTION

02

BACKGROUND



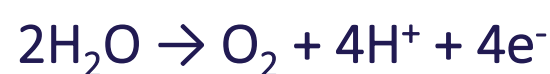
03

METHOD

ELECTROLYSIS OF SEAWATER

The process is based on **electrolysis** of seawater. When immersing a pair of electrodes in seawater and applying a relatively small electric voltage, the water molecules close to the electrodes will be split into hydrogen and oxygen according to the following equations [1]:

Anode reaction



Cathode reaction



MINERAL ACCRETION

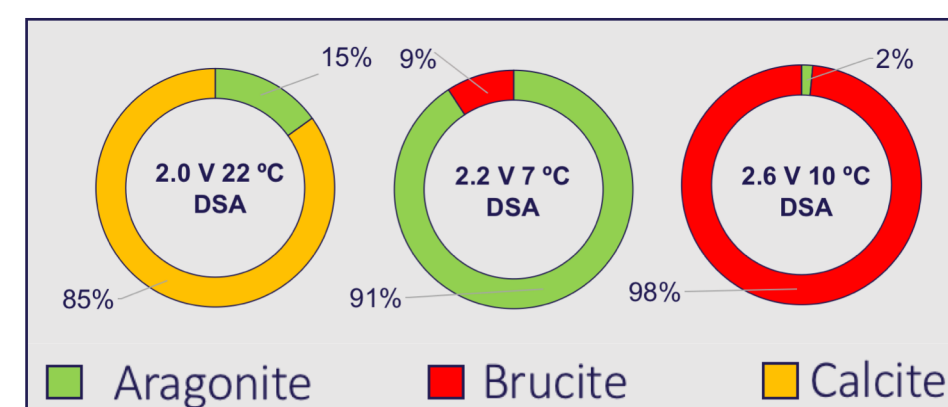
Among the ions dissolved in seawater calcium ions (Ca^{2+}) and carbonate ions (CO_3^{2-}) are of interest for mineral accretion by seawater electrolysis.

Calcium carbonate (CaCO_3) form two polymorphs in seawater, **aragonite** or **calcite** depending on factors like temperature and ion concentrations.

At relatively high voltages a softer material, magnesium hydroxide ($\text{Mg}(\text{OH})_2$, **brucite**) can precipitate [2].

MINERAL COMPOSITION

An initial voltage interval for **electrodeposited** material has been established experimentally, indicating that only a **narrow range** of voltage will result in deposition of CaCO_3 .



REFERENCES

- [1] Goreau. 2012. Marine electrolysis for building materials and environmental restoration. *Electrolysis*, InTech Publishing, Rijeka, Croatia, pp.273-290
- [2] Hilbertz. 1979. Electrodeposition of minerals in sea water: Experiments and applications. *IEEE Journal of Oceanic Engineering*, 4(3), pp.94-113