

# Proposal for master thesis

## Future Naval Energy Carriers - Could aluminium be an option from environmental point of view?

### Background

The world is facing an ongoing climate change and many political goals have been formulated to tackle the climate change. Shipping constituted 1.7% of the global GHG emissions in 2020 and is also associated with emissions of sulphur oxides and nitrogen oxides. Motor driven ships and vessels need to carry energy in one way or another to run engines for propulsion. In order to decarbonise shipping, the industry is looking at different possible energy carriers, all with pros and cons. Some alternative fuels that may replace today's use of fossil oil for shipping and their technological maturity are presented in fig. 1.

### Fuel pathway maturity map



Fig.1 Maturity of alternative fuels according to <https://www.zerocarbonsshipping.com>, Thomas McKenney at “Ammonia for shipping” webinar Dec. 12, 2022. The project looks at intercontinental shipping, hence batteries not on the list.

In addition to the fuels presented in fig. 1, interest has been raised in using metals as energy carriers and aluminium is of special interest. A schematic drawing of loop for using aluminium as an energy carrier is shown in figure 2.

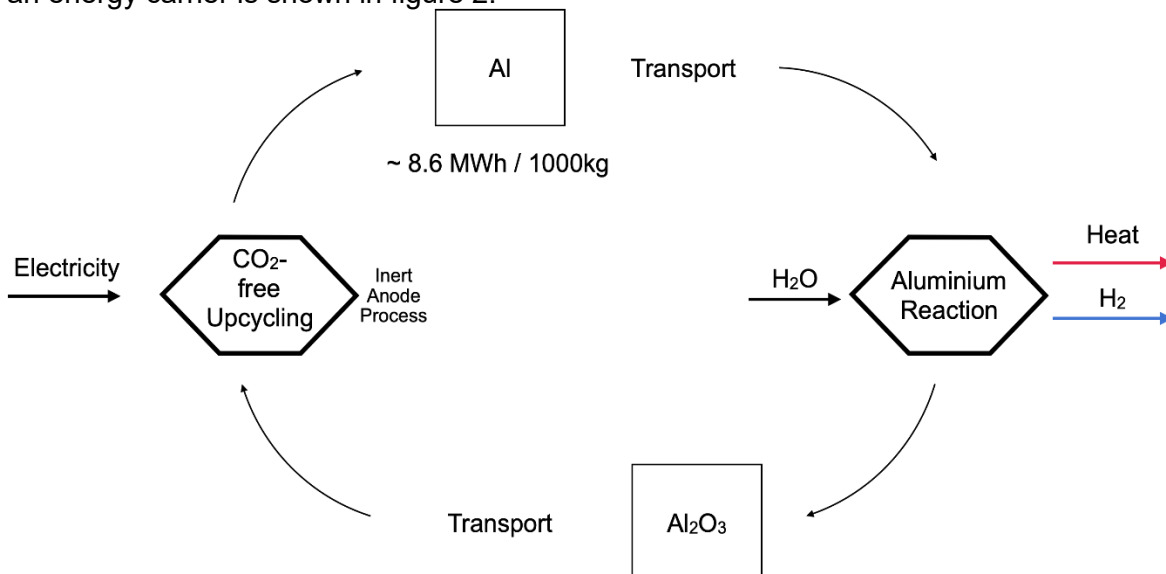


Figure 2: Al Energy loop

### **Description of Work**

The aim of this thesis is to study the environment impact of aluminium as energy carrier for long distance shipping and compare it to the environmental impact of alternative fuels. The environmental impact should be evaluated throughout the life cycle of the energy carrier and could include, for example, climate impact, eutrophication, acidification, land use as well as energy and resource use for producing and handling the energy carrier.

The master thesis will be conducted in collaboration with the companies Hi3 AB and Saab Kockums.

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