

# International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

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## Electrochemical Synthesis of $\alpha$ -Aluminium Hydride an advanced Propellant Ingredient

### Overview

In recent years, high performance solid propellant has been a great deal of attention in the area of high energy materials research field. Development of a high performance solid propellant will be achieved by using high energy density materials such as metal hydrides. Among the metal hydrides, aluminium Hydride,  $\text{AlH}_3$ , commonly known as alane is the most interesting fuels for propulsion, because of its ability to substantially increase the performance of a given system. The typical formation route of alane is through the chemical reaction. It involves high pressure operation and formation other by products like metal halide. For these reasons, our research attempt has been initiated in a more economically and thermodynamically cost effective synthetic and regeneration route to produce alane by electrochemical method.

### Key Features

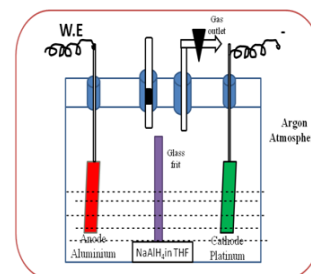
- Avoid the impractical high pressure needed to form  $\text{AlH}_3$
- Avoid chemical reaction route of  $\text{AlH}_3$  that leads to the formation of alkali halide salts such as  $\text{LiCl}$  or  $\text{NaCl}$
- Utilize electrolytic potential to translate electrochemical potential into chemical potential and drive chemical reactions to form  $\text{AlH}_3$

### Potential Applications

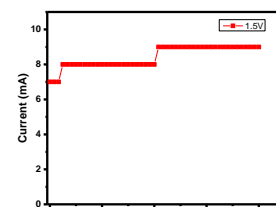
- As an additive in solid propellant
- On-board Hydrogen Storage

### Intellectual Property Development Indices (IPDI)

- Setting up electrochemical facility for synthesis of alane
- Preliminary single cell studies for alane preparation.



Schematic of Electrochemical setup for alane formation



Performance of Electrochemical cell during Alane synthesis

IPDI Status	1	2	3	4	5	6	7	8	9	10
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