

Project idea "Metal Fuel Energy Applications"

Successful R&I meeting Dusseldorf

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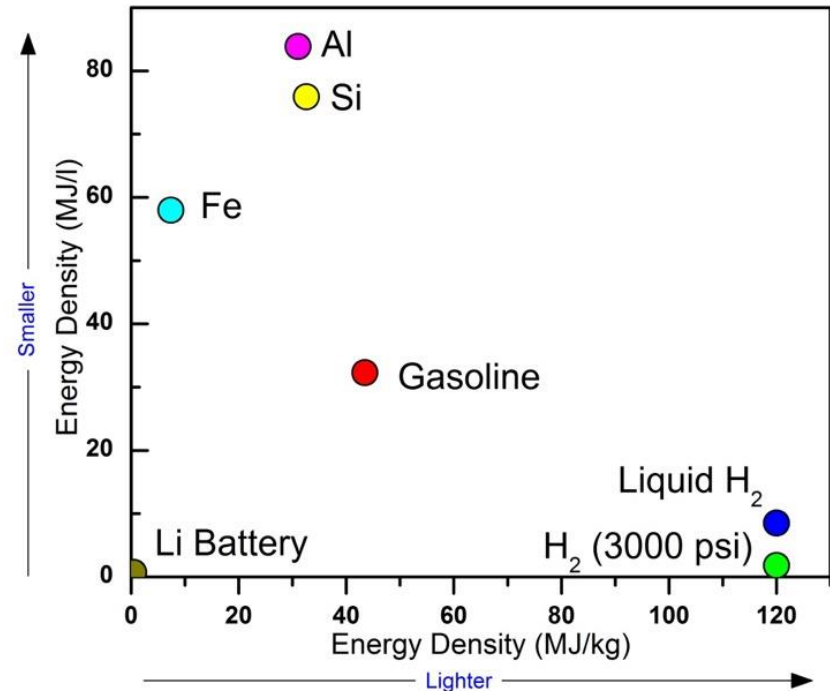
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Where innovation starts

Why Metal Fuels?

- **Challenge**
 - Renewable energy generated far from users
 - Dense energy carriers are needed
- **Solution**
 - Metal powder as a dense carbon-free energy carrier
- **Benefit**
 - Metals are energy dense, abundant and clean, and can be used as fuel



- Similar combustion temperature levels as hydrocarbons
- Similar combustion rates

Metal fuels as renewable energy carrier



dry route

Hydrogen,
solar or wind
energy

Metal oxide
Reduction
(H₂)

Metal
combustion
(O₂)

Power/heat

Solar or wind
energy

Metal oxide
Reduction
(elektrolysis)

Metal
combustion
(H₂O)

Power/heat
Hydrogen

wet route



- Requirement of metal oxide capture and removal (µm-sized)



Fits into topic of electrification

To initiate the cycles we use mineral and metal waste

Program output (partners sought)

- **Non-carbon-emitting cyclic energy generation**
 - Large scale energy generation (use existing infrastructure)
 - Combined heat and power
- **New means of high-density energy storage**
- **New means of hydrogen production (about € 2/kg H₂)**
- **New electrolyser technology (spinning disc- and high temperature fuel cell-based)**
- **Solutions for marine and heavy transport (metal fuel-based combustion engines) Batteries too large and heavy**
- **Metal waste treatment approaches**

Development circular economy

Basic consortium available, looking for Industry, SME, RTOs

Planned projects

- **H2020 CE-SPIRE-09-2020: Making the most of mineral waste, by-products and recycled material as feed for high volume production (IA)**
- **LC-NMBP-29-2019: Materials for non-battery based energy storage (RIA)**
- **Dutch NWO Perspectief program “MetalCycles”, 5.3 M€ (30% by partners, user committee members welcomed)**

- **Project integration into Metalot initiative**
(<http://www.metalot.nl/?lang=en>)

Experience

- **Eindhoven University of Technology has been involved in:**
 - FP6 100 projects
 - FP7 250 projects
 - H2020 170 projects (-2017)
- **Energy themes:**
 - H2020 7 projects (1 coordinating)
 - FP 7 11 projects (1 coordinating)

Research support network

35 people for project/program support