**Molecular Photoconversion Devices Division (hv  H2, electricity)**

http://i2cner.kyushu-u.ac.jp/upload\_file/editor\_files/Division-Road-Map-2017/Molecular\_Photoconversion\_Devices\_June\_2017\_Final\_version\_role\_edit3.pdf

1. **Org-inorg hybrid perovskite solar cell – 2021-2025:** >25% efficiency, “50% lifetime > 50000h”. 2025-2050 - > 30% efficiency, “50% lifetime > 90000h”.
2. **Hybrid catalyst for photo water splitting –** not relevant
3. **Solar fuel (H2, HCOOH, CH3OH, CH4) –** 2025-2050 : application in solar energy conversion and storage => not relevant?
4. **High pressure cpds for photocatalysis –** 2021-2025: convert co2 to fuels, 10% efficiency, 2025-2050 – 20% efficiency (needs more research)
5. **OLEDs/hybrid perovskite LEDs –** not relevant
6. **Low friction bearings/surface molecular brush –** not relevant

## Hydrogen Materials Compatibility Division (not relevant)

## http://i2cner.kyushu-u.ac.jp/upload\_file/editor\_files/Division-Road-Map-2017/Hydrogen\_Materials\_Compatibility\_June\_2017\_Final\_version\_role\_edit3.pdf

## Predictive models of H2-assisted cracking

## Material development for H2 service

## Modelling environmental effects on friction and tribological failures

## Electrochemical Energy Conversion Division

## http://i2cner.kyushu-u.ac.jp/upload\_file/editor\_files/Division-Road-Map-2017/Electrochemical\_Energy\_Conversion\_June\_2017\_Final\_version\_role\_edit3.pdf

1. Electrode -not relevant
2. Electrolyte – not relevant
3. **Polymer electrolyte fuel cell (PEFC)** – **automotive (more research)**
4. **Solid Oxide fuel Cell (SOFC) – stationary electricity generation (more research)**
5. Energy Storage – not modelling

**Thermal Science and Engineering Division**

<http://i2cner.kyushu-u.ac.jp/upload_file/editor_files/Division-Road-Map-2017/Thermal_Science_Engineering_June_2017_Final_version_role_edit3.pdf>

1. TP1-TP3 : measurement of thermophysical properties
2. HMT1 and HMT2 : phase change heat transfer, adsorption study
3. TES1 : Adsoprtion heat pump, refrigeration system for waste heat utilization (50 -200 C)
4. TES2: Vapour compression heat pump/refrigeration system with low GWP refrigerants, high COP
5. **TES3: IGCC (syngas) and H2 oxy (liquid H2) power gen system :** 2031-50 – pilot scale plant system – 1 MWt power gen system (prototype? commercial deployment? electric output/figures?) need data

## Catalytic Materials Transformations Division

## <http://i2cner.kyushu-u.ac.jp/upload_file/editor_files/Division-Road-Map-2017/Catalytic_Material_Transformation_June_2017_Final_version_role_edit3.pdf>

## Catalyst development

## Catalysis process development for carbon neutral power generation cycles

## CO2 Capture and Utilization (CCU) Division

## Develop novel membrane technology to separate CO2 from the mixture - CO2 capture from flue gas of coal / natural gas power generation for CCS / CCUS system

## Develop novel catalysts and electrodes for the conversion of CO2 into value-added fuels or their intermediates (e.g. CO, Methanol and hydrocarbon)

## Liquid absorption – 54-64 USD/t-CO2, 200-230 kWh/t-CO2, target – 22 USD/t-CO2 (METI 2010 report)

## Solid adsorption – 144-188 USD, 640-680 kWh/t-CO2, target – 17 USD/t-CO2

## CO2 Storage (CS) Division

## Projects Objectives Efforts Researchers Project 1 Molecular-scale CO2 investigation

## Project 2 Pore-scale CO2 investigation

1. CO2 migration model for CO2 storage and monitoring in CCS (field scale investigation, all three coupled)