

PREIN - Photonics research and innovation flagship

Surface Science Approach to Solar Fuel Production via Artificial Photosynthesis

**SUNRISE Finland Stakeholder Workshop
December 2019**

**Professor Mika Valden
Tampere University**

Agenda

1. **Tampere University**
2. PREIN – Photonics Research and Innovation Flagship
3. Solar energy research activities in PREIN

**The University of Tampere,
Tampere University of Technology and
Tampere University of Applied Sciences
formed a new higher education community
at the beginning of 2019.**



More than **30,000 students**,
nearly **5,000 employees**.

We're
a community
of over
35,000
members!

A photograph of a smiling man with a beard and short brown hair, wearing a denim shirt, is partially visible on the left side of the slide. The image is overlaid with a semi-transparent purple filter.

**The Tampere
higher education
community has a
new way of
doing things.**

**The priority
areas of the new
Tampere higher
education
community are
technology,
health and
society. Our
particular strength
is the combination
of these areas.**

Agenda

1. Tampere University
- 2. PREIN – Photonics Research and Innovation Flagship**
3. Solar energy research activities in PREIN



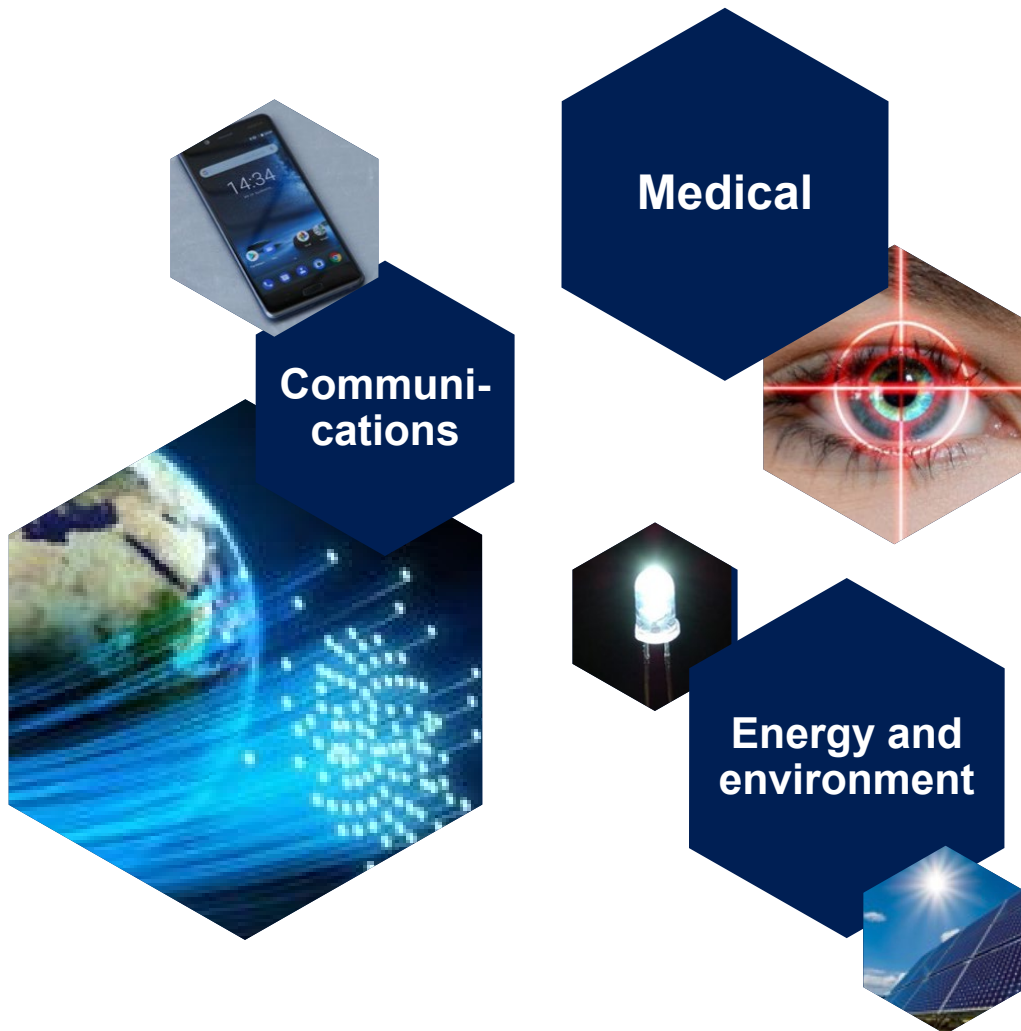
www.prein.fi

PREIN – PHOTONICS RESEARCH AND INNOVATION FLAGSHIP

Light-based solutions: from scientific
excellence to industrial and societal impact



Photonics Revolutionising life



200+ companies

4000 professionals

1 B€ revenue

20% annual growth

**Lynchpin of
\$7 trillion industry**

Source:
National Academy
of Sciences, USA

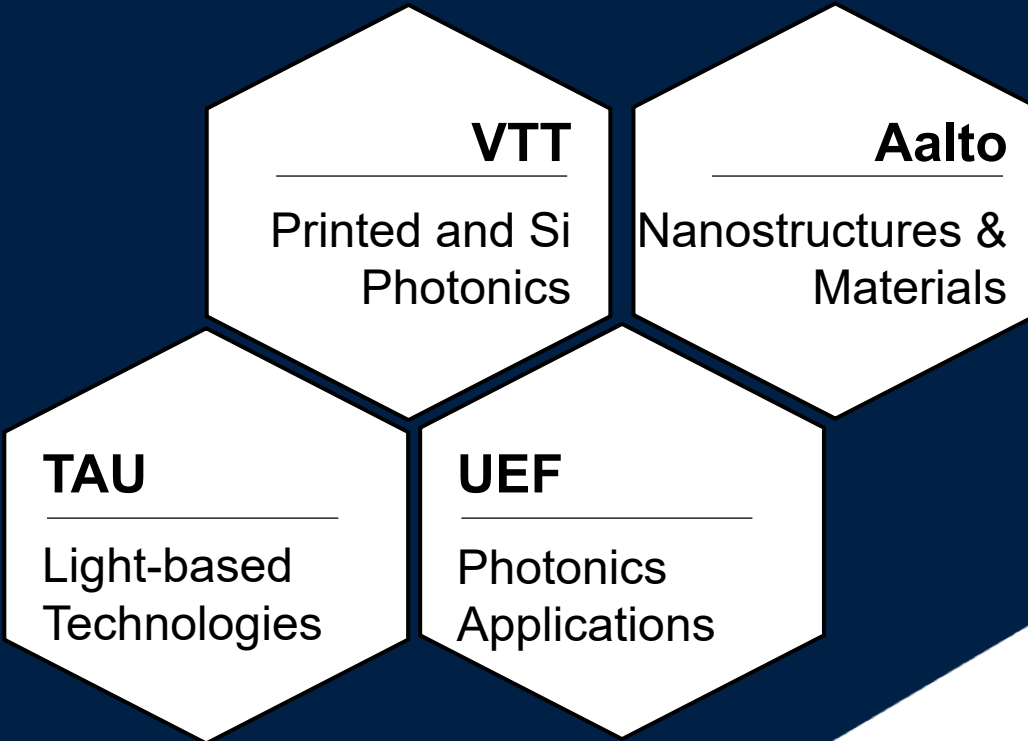
Europe in 2020

10% of jobs
depend on
Photonics

Europe in 2030

1 million new jobs

CUTTING EDGE OF FINNISH PHOTONICS EXPERTISE



**PREIN
PARTNERS**

**WORLDWIDE LEADERS IN
MANY SUB-AREAS OF PHOTONICS**

- **Diverse profiles**
- **Complementary infrastructure**
- **>350 people on 4 sites**

MEASURES OF SUCCESS

2015-2018



2019-2022

Long-term development of
Finnish Photonics Ecosystem

Science & Education



MSc degrees
147 ▶ **250**
PhD degrees
77 ▶ **100**

Economy & Society



Growth scenario
of Finnish
Photonics Industry

Investments & Developments



Shared used of
infrastructure
X2



Joint Publications
150 ▶ **300**



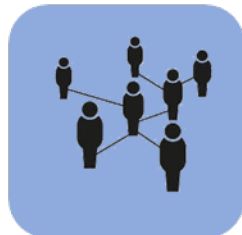
Diversity
20% ▶ **30%**



Infrastructure for
Photonics
9M€ ▶ **20M€**



Patent Applications
34 ▶ **>50**



Networking events
10 ▶ **20**



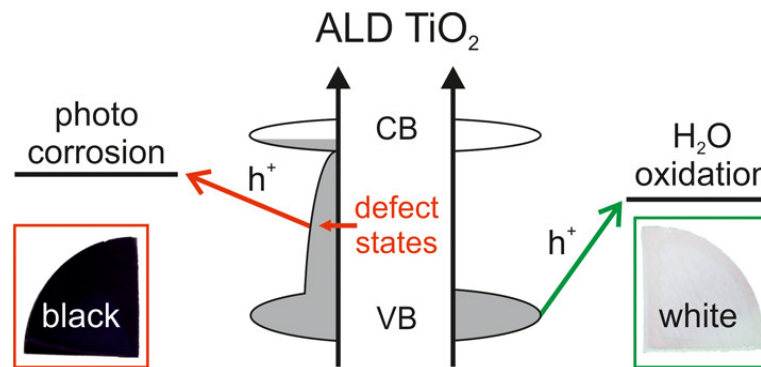
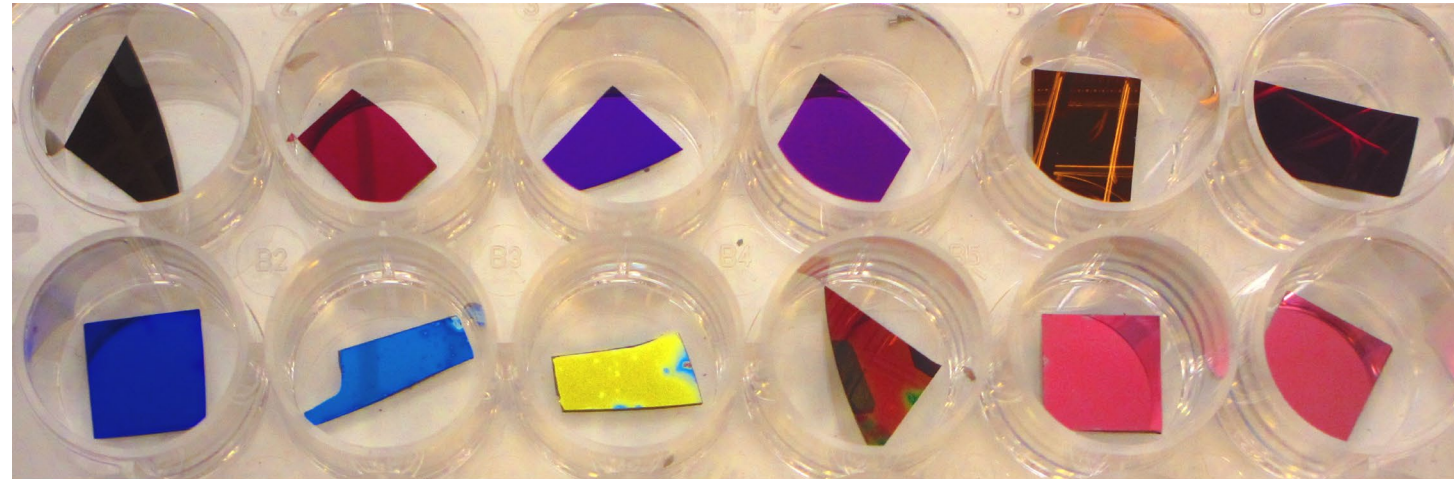
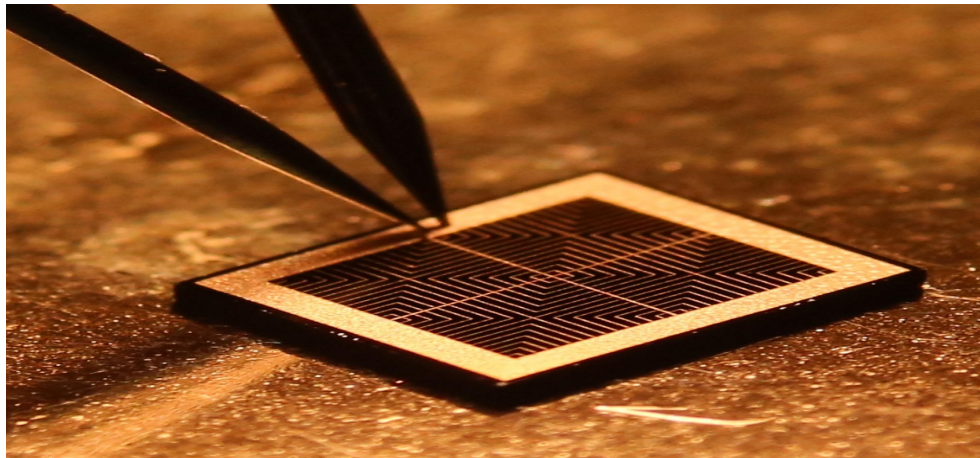
Internal leverage
x7
Total leverage
x16

Agenda

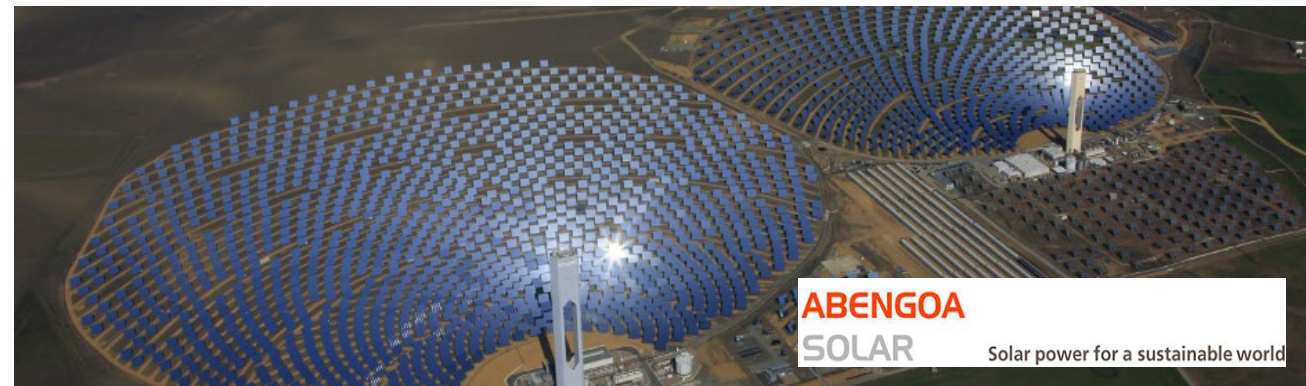
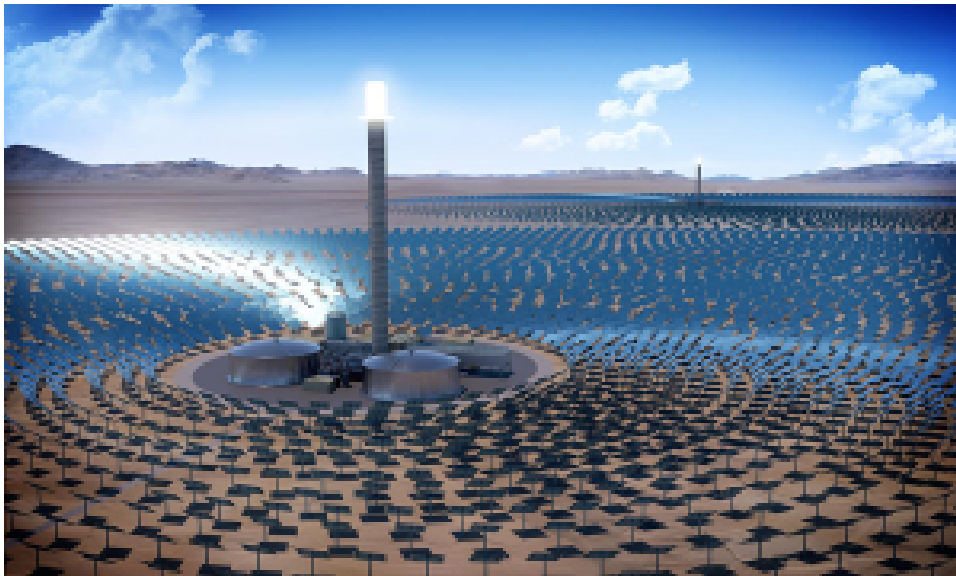
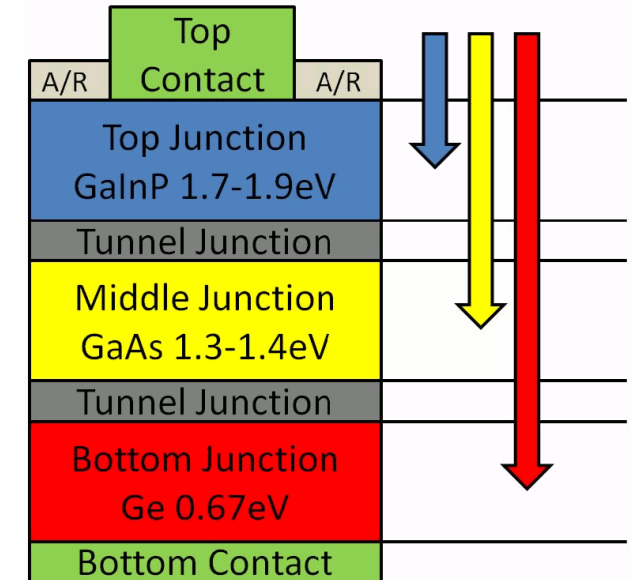
1. Tampere University
2. PREIN – Photonics Research and Innovation Flagship
- 3. Solar energy research activities in PREIN**

How to make efficient solar cell work as solar *fuel* cell!!

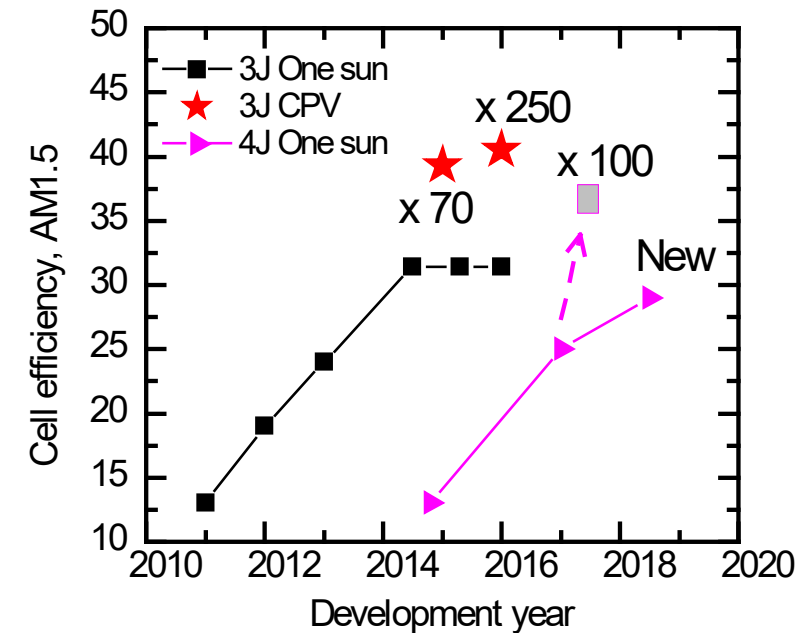
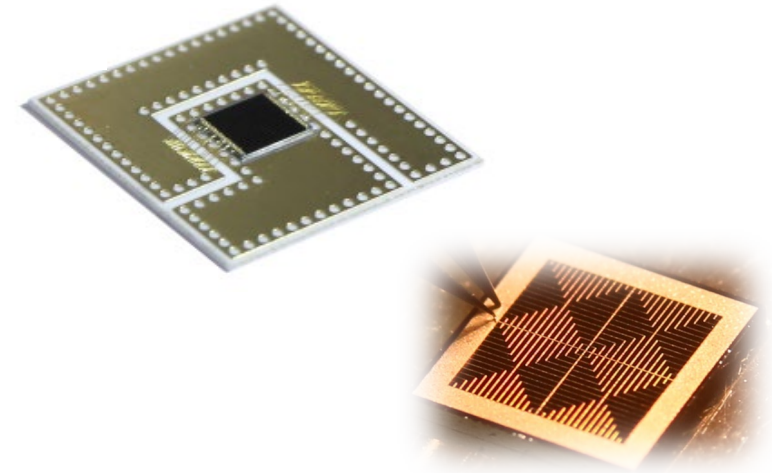
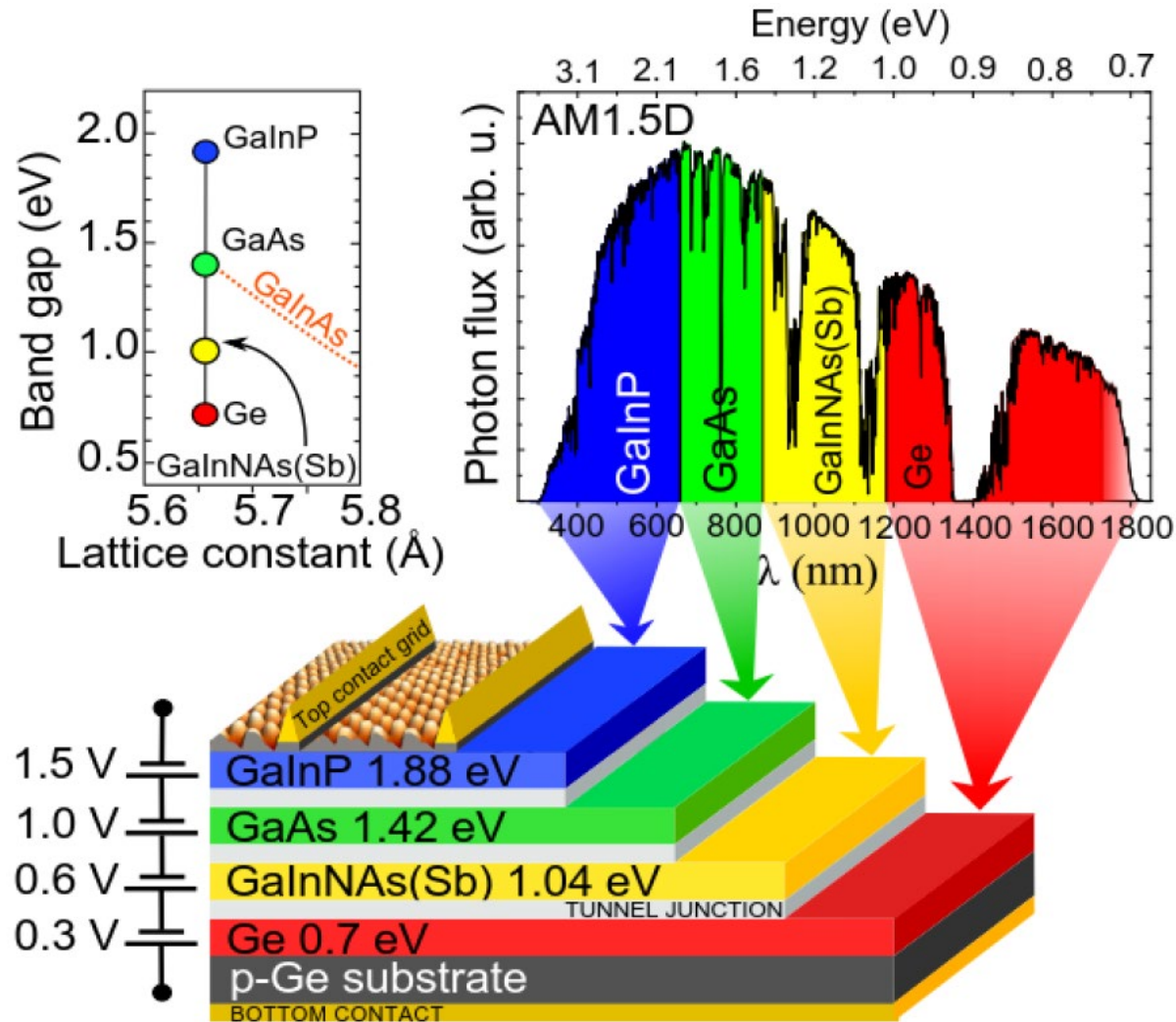
Conversion of CO_2 and H_2O to higher higher hydrocarbons



Concentrated Solar Energy



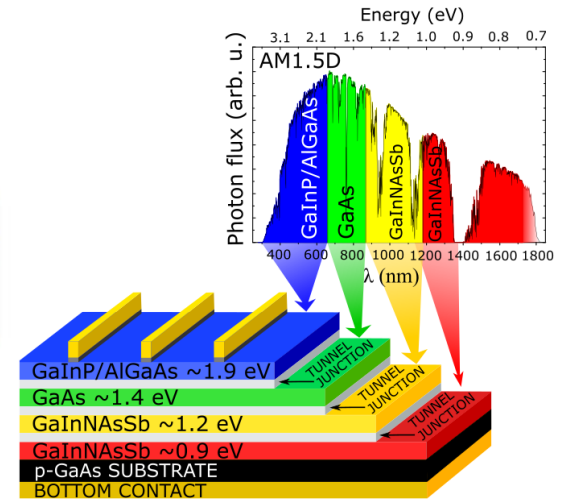
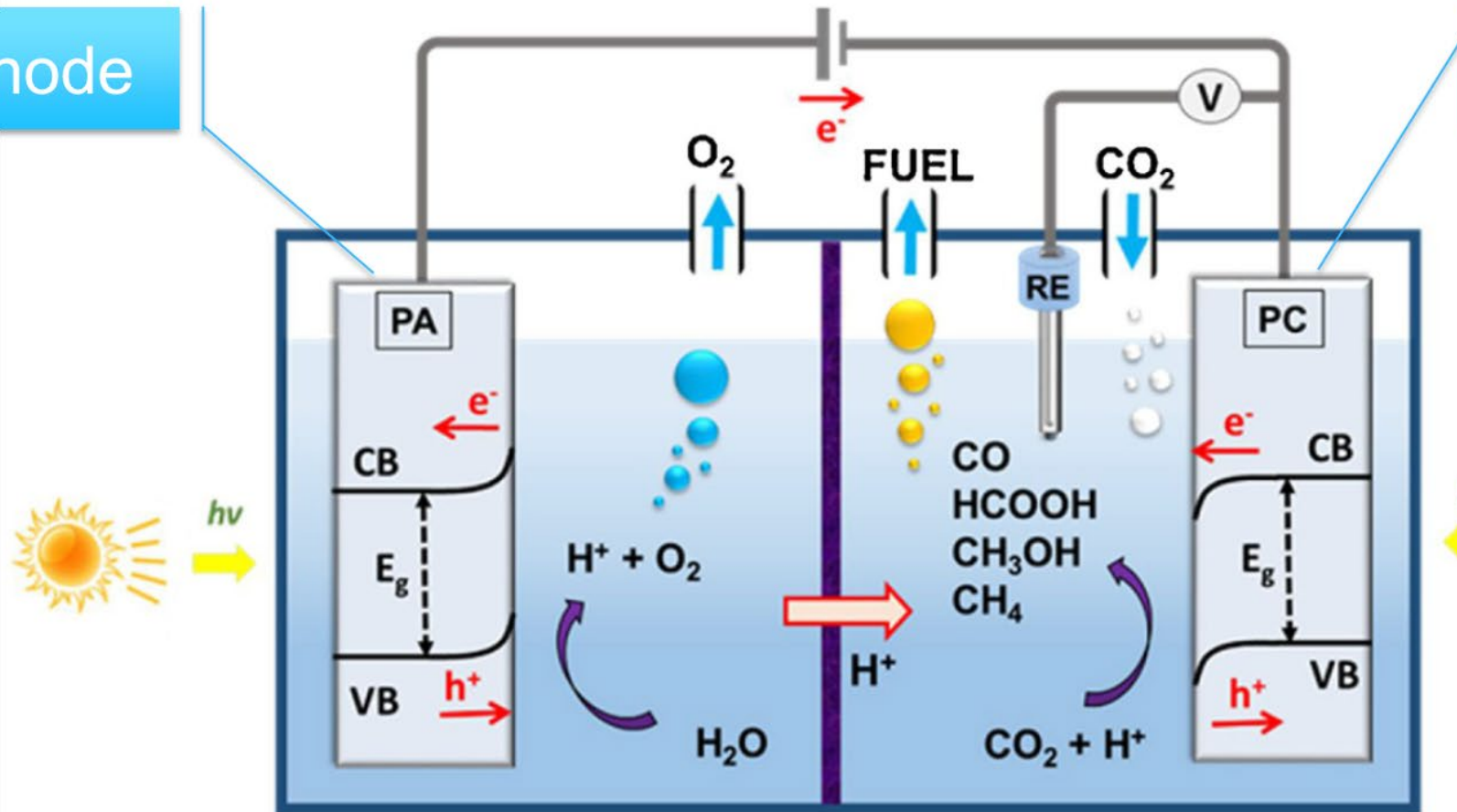
High-efficiency solar cells



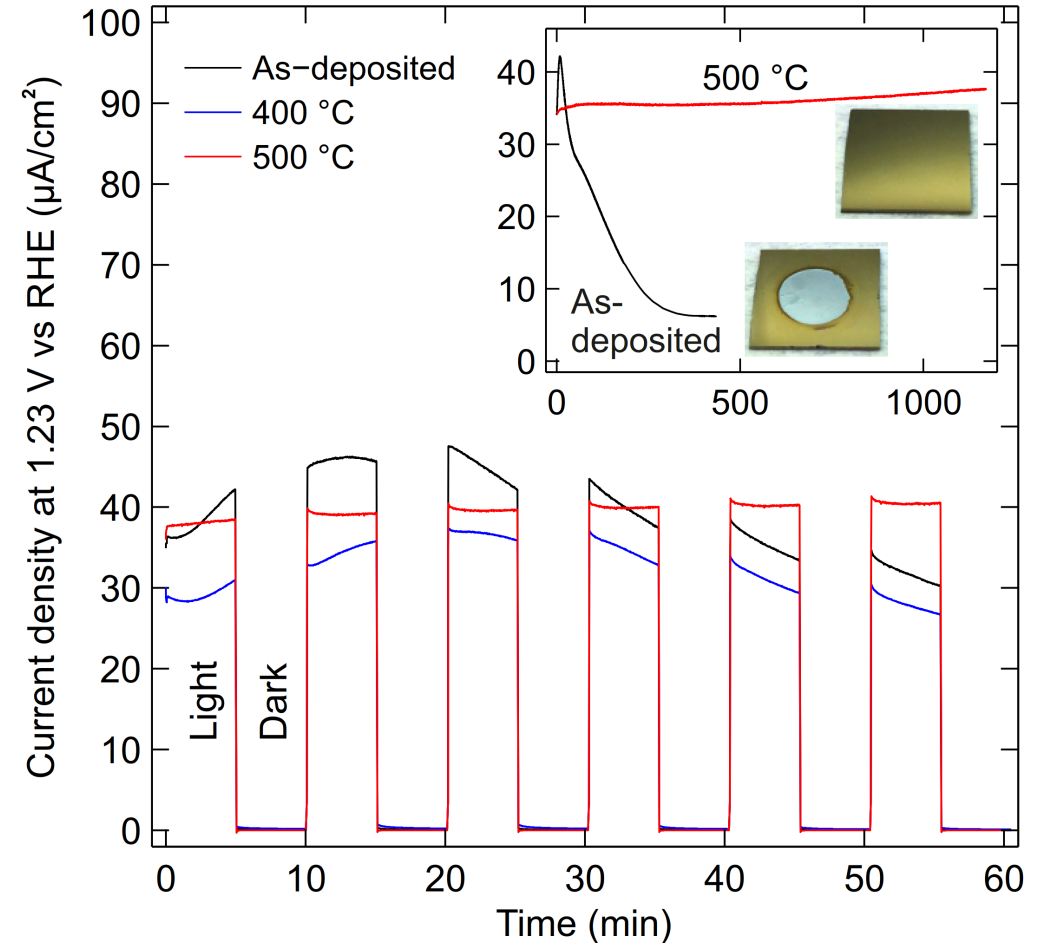
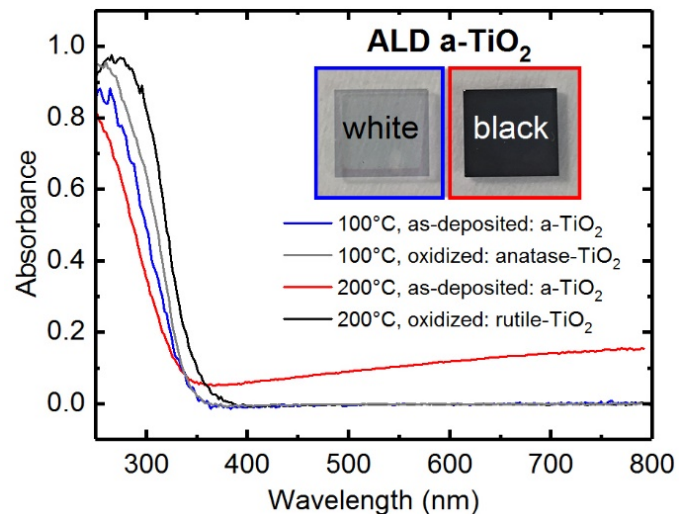
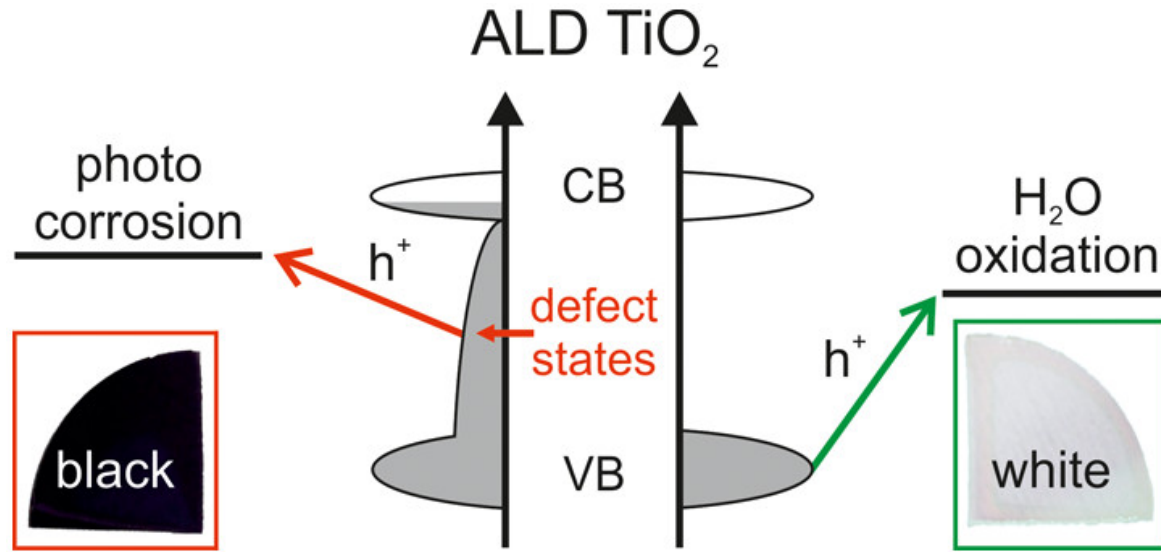
Solar Cell → Solar *Fuel* Cell

Coverion of CO_2 and H_2O to HC

Photoanode



Solar Cell → Solar *Fuel* Cell



Thank you, any questions?



At the university's roof with CPV system for testing our multi-junction solar cells