

# **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

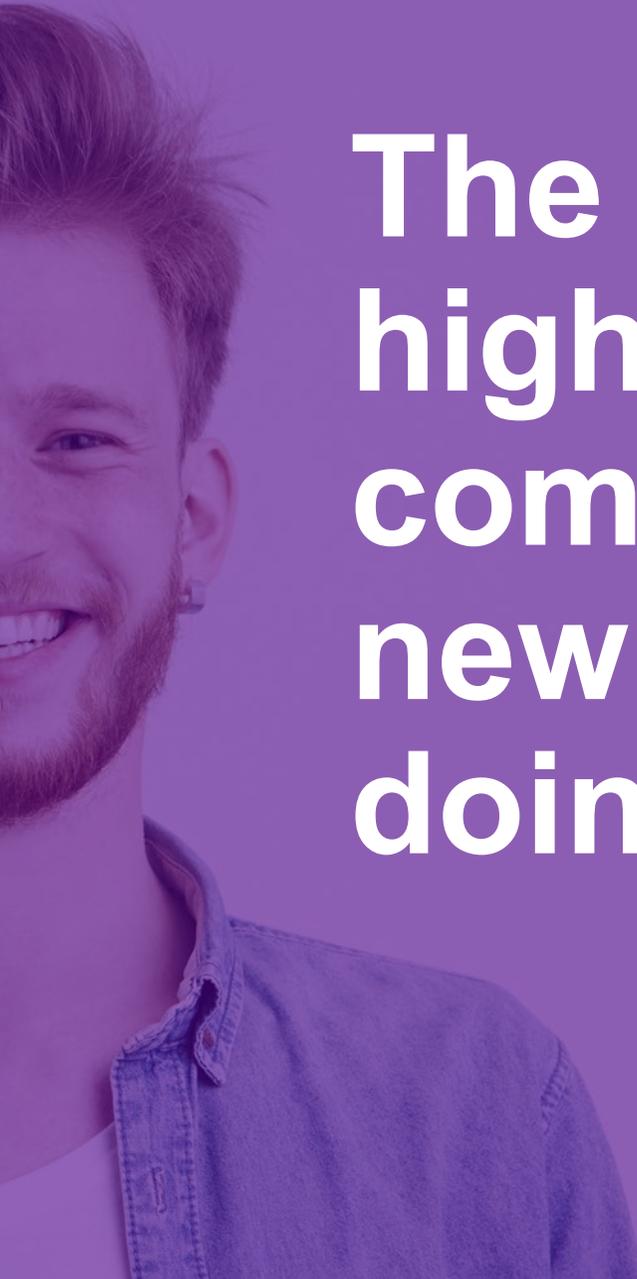
- 1. Tampere University**
2. PREIN – Photonics Research and Innovation Flagship
3. Solar energy research activities in PREIN

**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!



**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



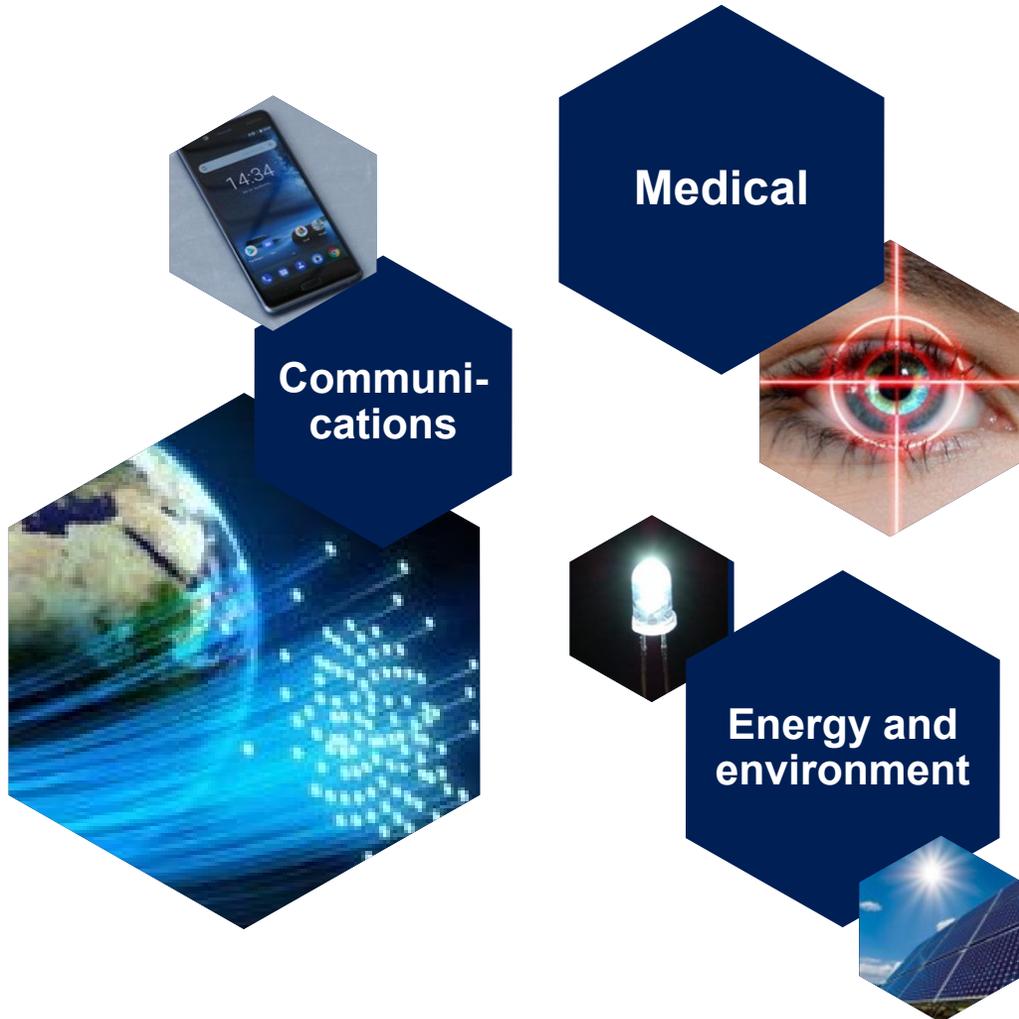
[www.prein.fi](http://www.prein.fi)

# PREIN – PHOTONICS RESEARCH AND INNOVATION FLAGSHIP

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



# Photonics Revolutionising life



 **Photonics Finland**

**200+ companies**

**4000 professionals**

**1 B€ revenue**

**20% annual growth**

**Lynchpin of  
\$7 trillion industry**

**Source:**  
National Academy  
of Sciences, USA

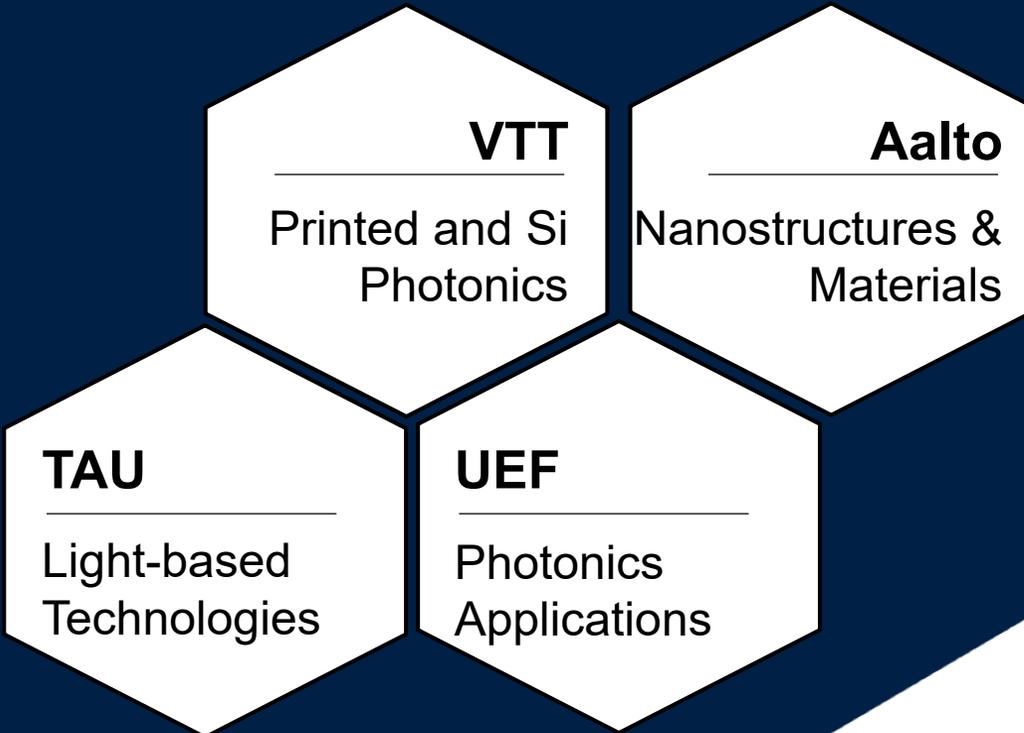
**Europe in 2020**

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



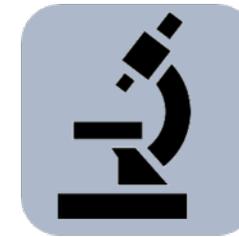
MSc degrees  
147  250  
PhD degrees  
77  100

## Economy & Society



Growth scenario  
of Finnish  
Photonics Industry

## Investments & Developments



Shared used of  
infrastructure  
X2



Joint Publications  
150  300



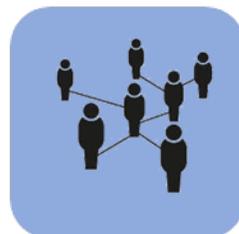
Diversity  
20%  30%



Infrastructure for  
Photonics  
9M€  20M€



Patent Applications  
34  >50



Networking events  
10  20



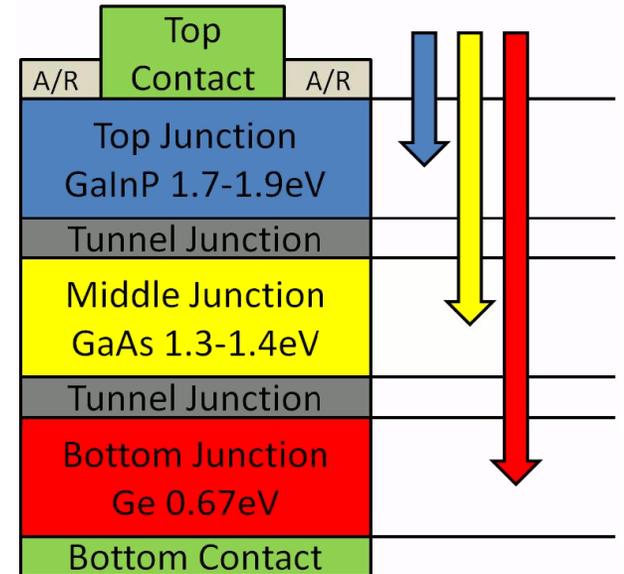
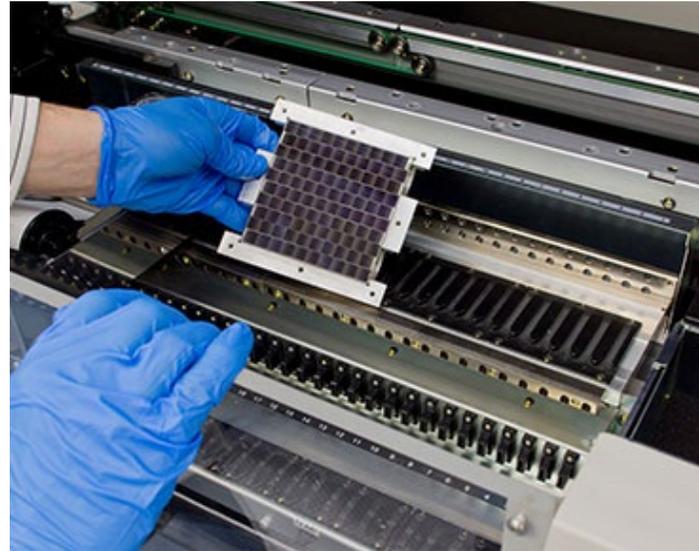
Internal leverage  
x7  
Total leverage  
x16

# Agenda

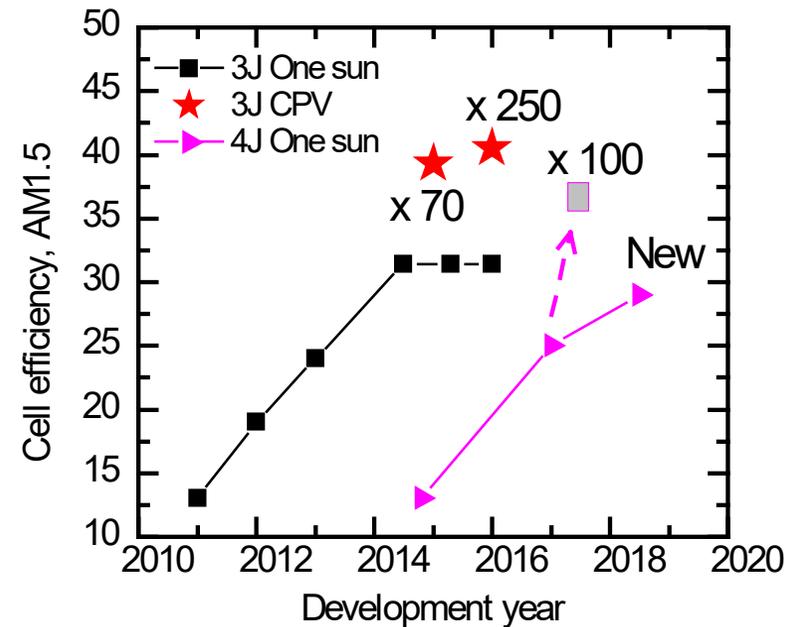
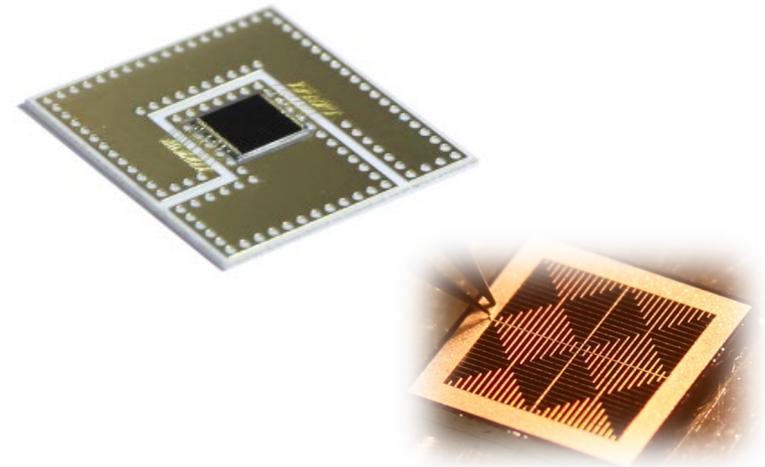
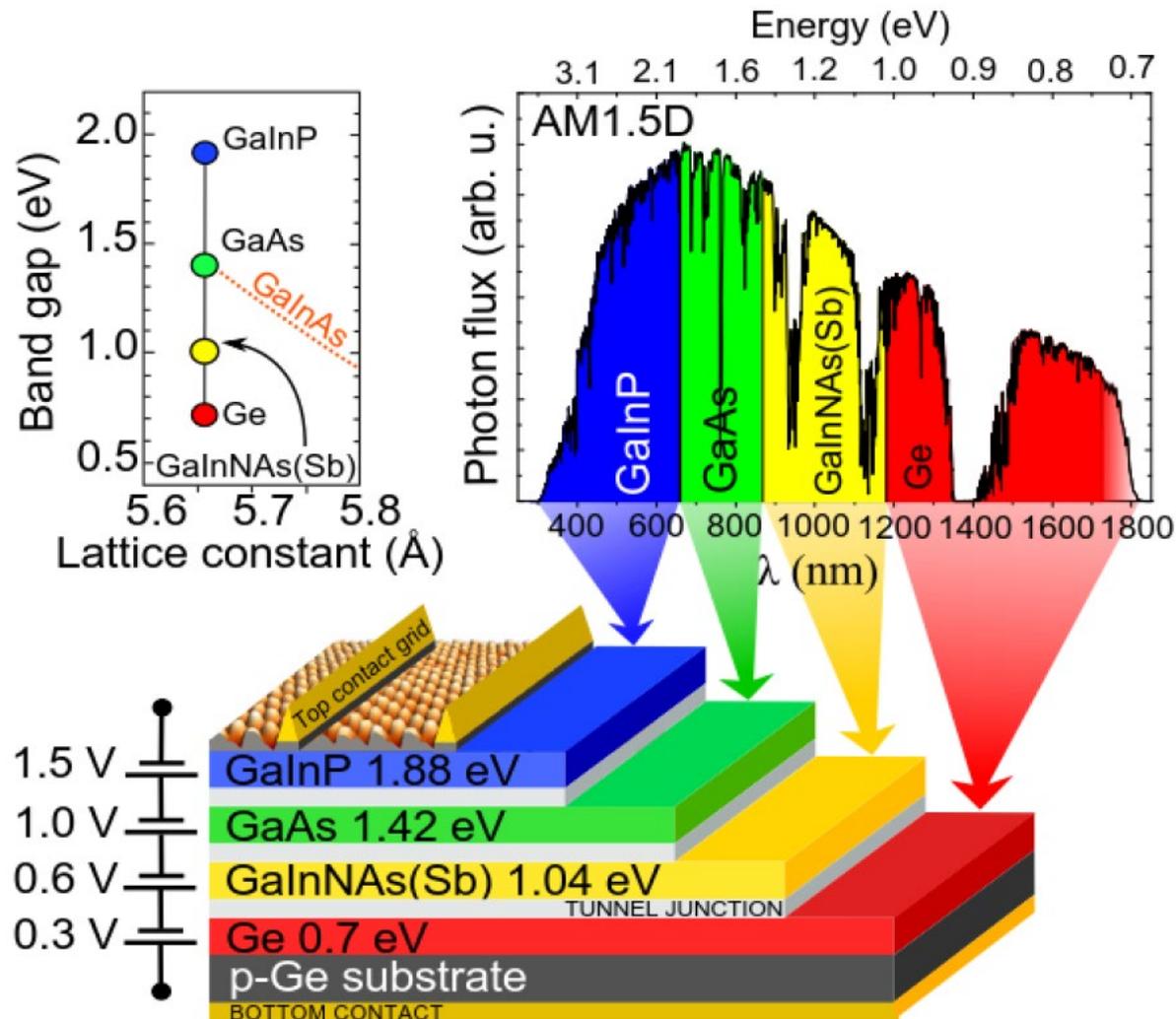
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3. **Solar energy research activities in PREIN**



# Concentrated Solar Energy



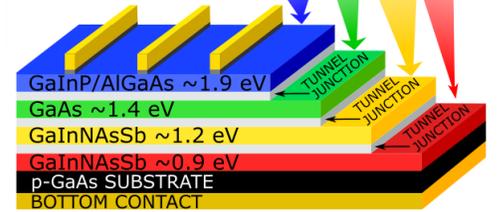
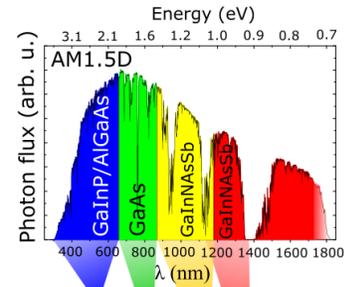
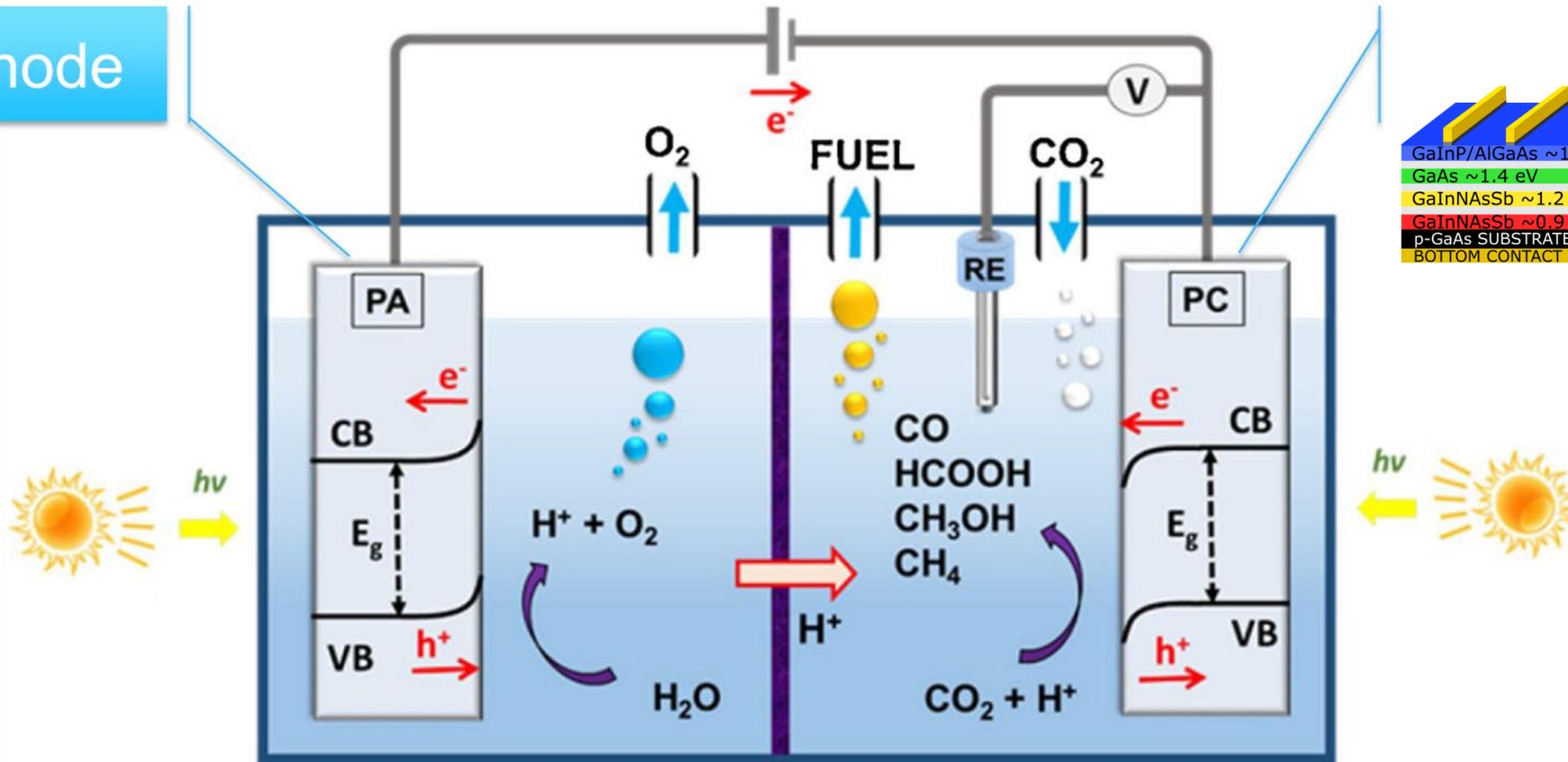
# High-efficiency solar cells



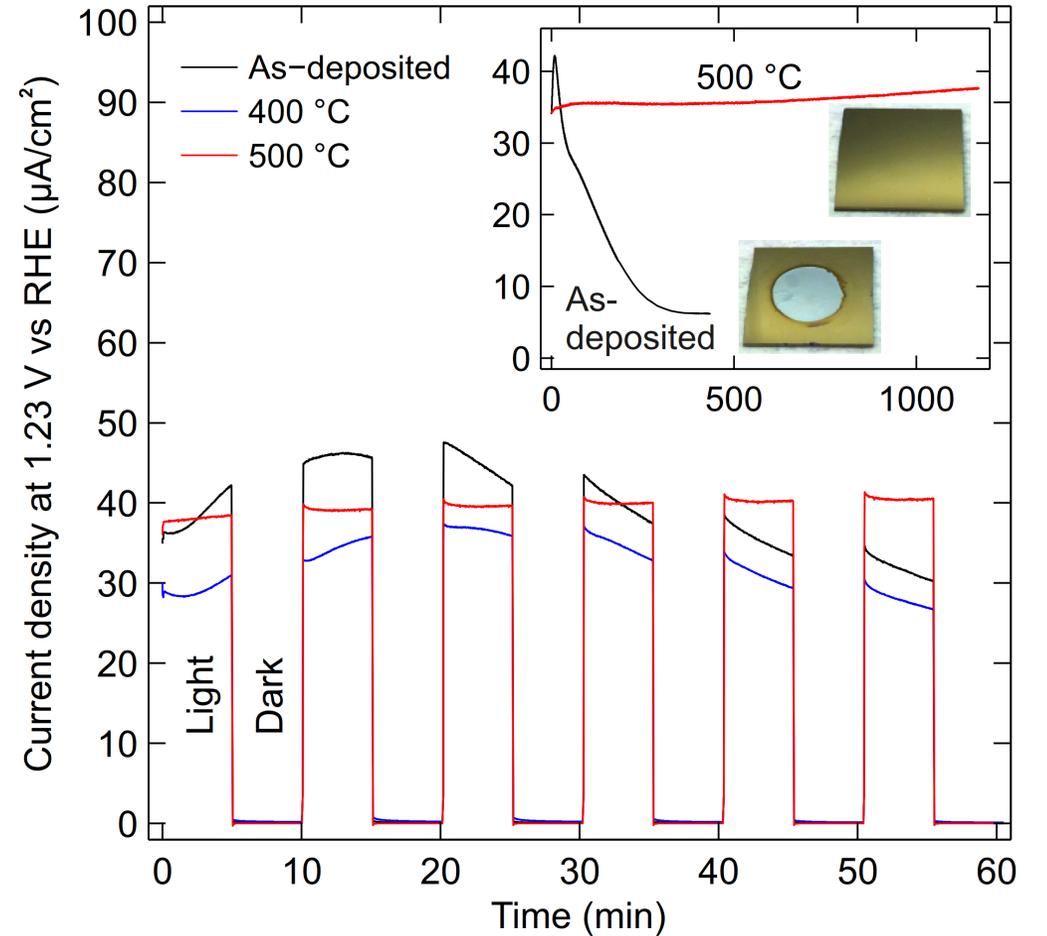
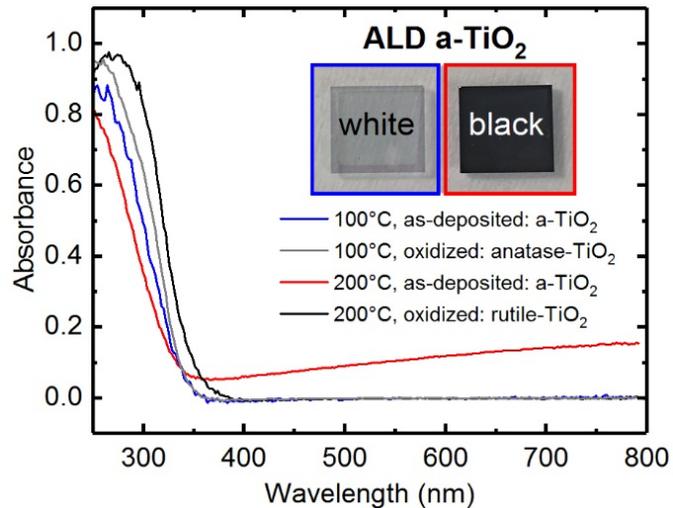
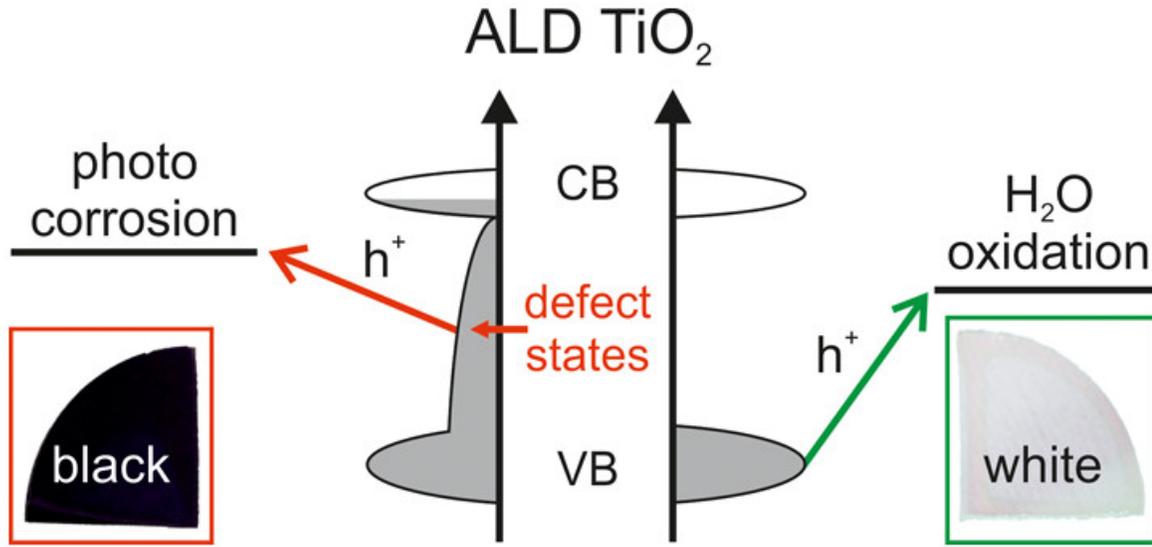
# Solar Cell → Solar Fuel Cell

Conversion of CO<sub>2</sub> and H<sub>2</sub>O 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