

## **Critical points of III-V semiconductor device structures for sustainable photoelectrochemical solar fuels production**

**Prof. Thomas Hannappel**

*Head of the department “Fundamentals of Energy Materials”*

*Dean of the Master course “Renewable Energy Techniques” at the Institute of Physics,  
Technische Universität (TU) Ilmenau*

### **Summary:**

III-V semiconductor-based photoelectrochemical (PEC) devices show the highest solar-to-electricity or solar-to-fuel conversion efficiencies. Here, GaInP is a relevant top photoabsorber layer in PEC for integrated and direct solar fuel production, due to its tunable lattice constant, electronic band structure, and favourable optical properties. On the other hand, the sustainability of III-Vs is always an issue and will be critically discussed. In the device structures, the understanding of the atomic and electronic properties of the heterointerfaces is crucial for the reduction of photocurrent losses in III–V multijunction devices. In addition, the chemical passivation against degradation and chemical corrosion is important to increase the surface stability. I will report on different potential device structures including nanowire-based device components and contact layers, their analysis in terms of interfacial properties and suitability as passivation layers.