UNIVERSITÄT DUISBURG ESSEN

SFB 616

Device types for chemicurrent detection: Metal-Insulator-Metal and Stepped-Metal-Insulator-Semiconductor

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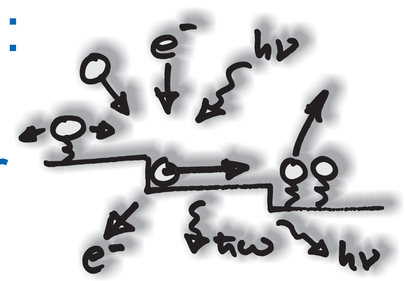
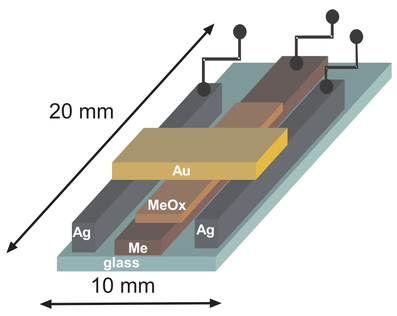


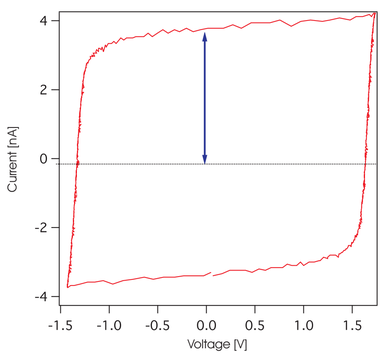
A2

Aims:

- Development of sensitive chemicurrent devices via photocurrent characterisation
- Detection of temperature induced band structure changes via temperature dependence of photocurrents
- Use of molecular beams as dark particle sources in reactions at various sample temperatures
- Chemicurrent detection during reactions (water formation and CO oxidation)

Metal-Insulator-Metal Device





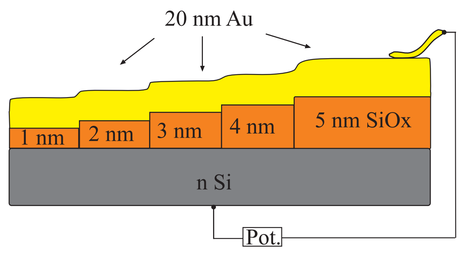
Set up

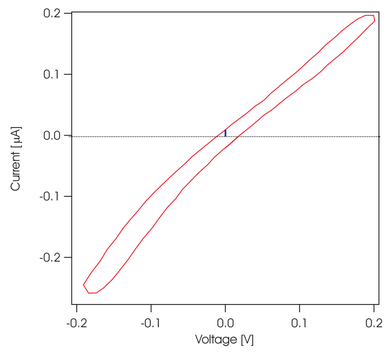
- 30 nm metal
- 3-4 nm electrochemically formed oxide
- 20 nm gold

I-V-Curve Au/AlO_x/Al

- Scan rate 100 mV/s
- Capacity 18 nF/mm^2

Stepped-Metal-Insulator-Semiconductor Device





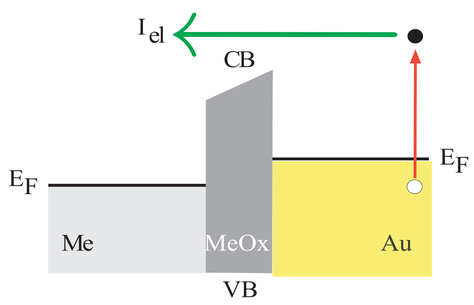
Set up

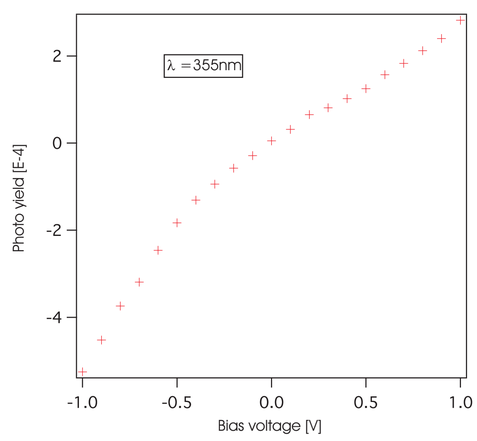
- 525 µm n-Si wafer
- electrochemically fomed stepped oxide 1-5 nm step width 2-3 mm
- 20 nm gold

I-V-Curve Au/SiO_x/Si

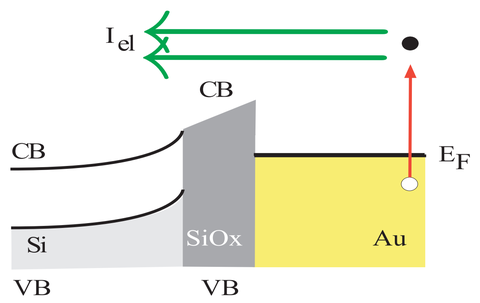
- Scan rate 100 mV/s
- Capacity 7.5 nF/mm^2

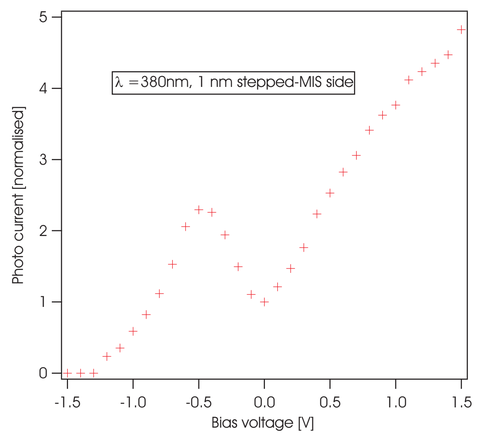
MIM Photocurrent





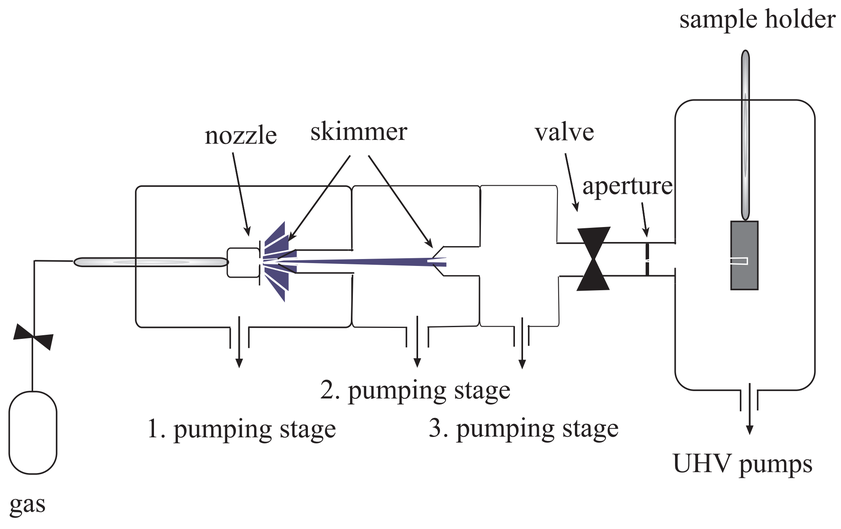
Stepped-MIS Photocurrent





Low barrier MIS detectors are up to 1000 times more photo sensitive than MIM detectors

Outlook: Molecular beam experiments



Chemicurrent detection in H_2 and CO oxidation reaction during

- Adsorption
- Product formation
- Desorption

- H_2O formation T > 180 K and T < 180 K
- CO oxidation T > 400 K

References

- Y. Jeliazova, M. Kayser, B. Mildner, A. W. Hassel and D. Diesing, Thin Solid Films 500, 330 (2006)
- K. Stella and D. Diesing, Journal of The Electrochemical Society 154, C663 (2007)

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