

Electron dynamics in transition metal oxides

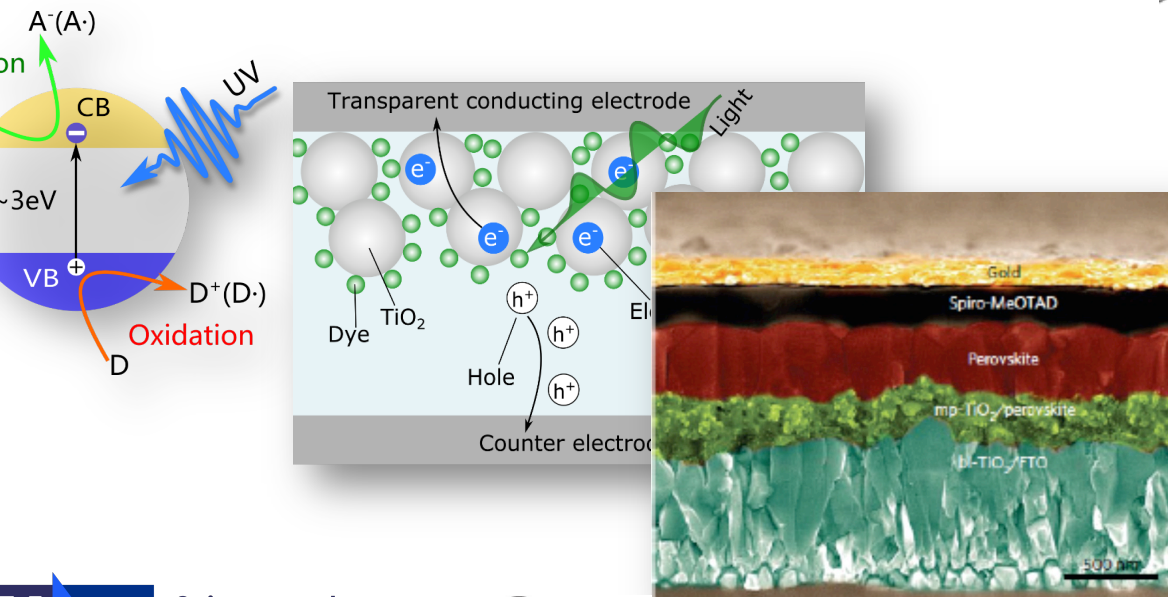
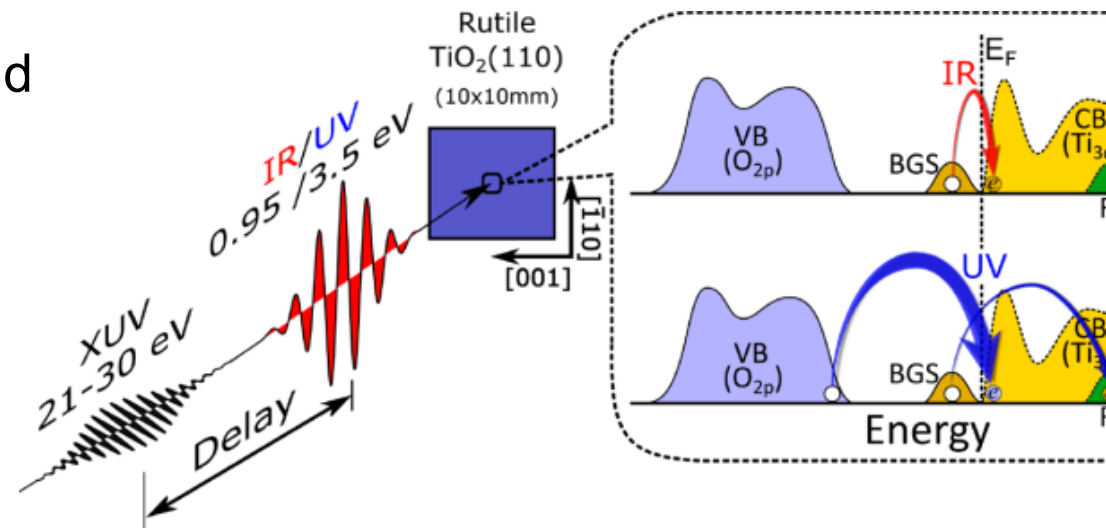
Time Resolved Photoemission

Geoff Thornton, UCL

Applications in photovoltaics, photochemistry and catalysis.

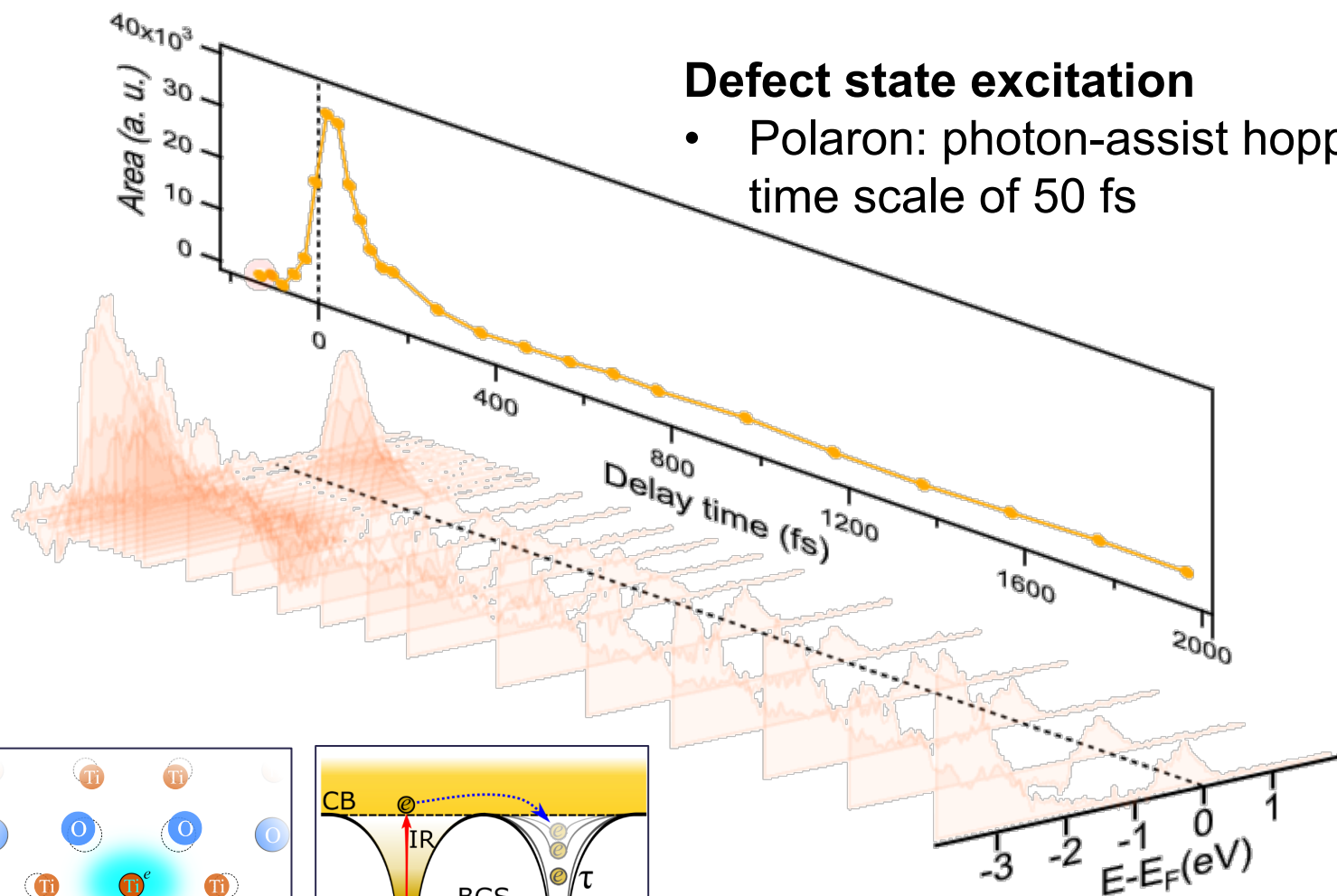
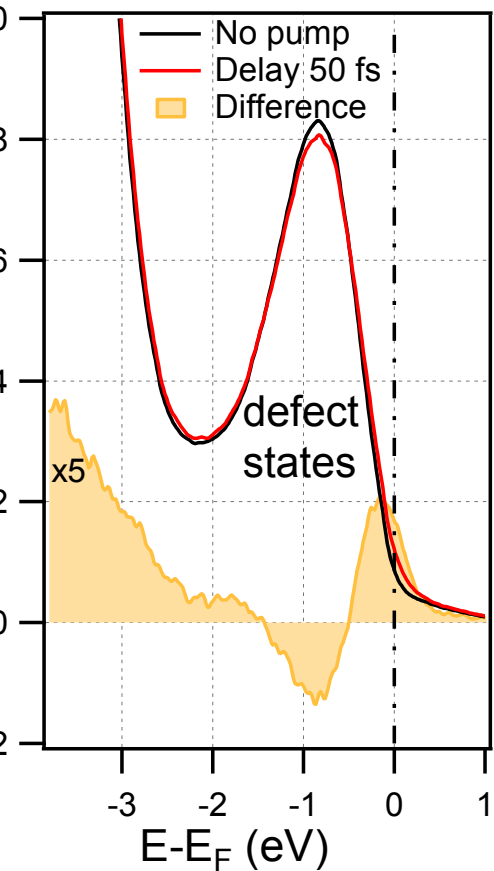
Large band gap of a few electron volts.

- ✓ TiO_2 band gap: ~ 3 eV
- ✓ Photocatalysis and light harvesting



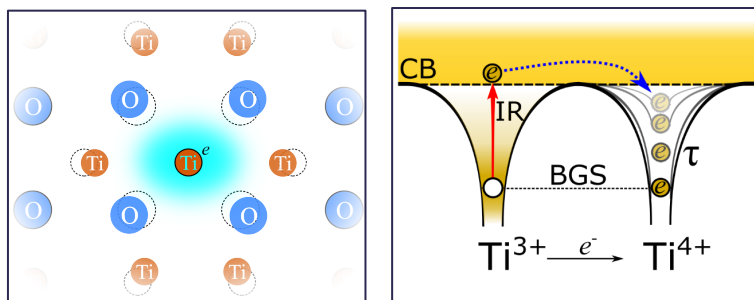
Time-resolved photoelectron spectroscopy with XUV.

- Dynamics of conduction band (CB) and valence band (VB)
- Selective excitations
 - ✓ $\text{VB} \rightarrow \text{CB}$ transition
 - ✓ Polaron excitation



Defect state excitation

- Polaron: photon-assist hopping in time scale of 50 fs



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Future Prospects:

C,N,O core level photoemission to investigate water chemistry, photodegradation on transition metal oxides—EuXFEL up to 1 keV
Eg Hybrid perovskites, element-specific recombination paths and charge transfer to electron and hole collectors

Time resolved photoelectron diffraction to follow electron path following pump pulse

Tender X-rays (4 keV) and HAXPES measurements at liquid solid interfaces for hybrid perovskite/ TiO_2 interfaces