Condensed matter physics of energy Materials

Staff (2024):

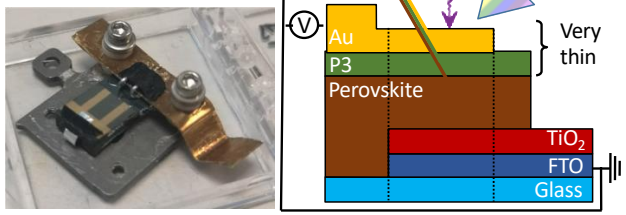
- Program professor (PAP): Håkan Rensmo
- Faculty members **9**, present (4 female/5 male):
  Ute Cappel, Rebecka Lindblad, Venkata Kamalakar Mutta, Maria Hahlin,
  Andreas Lindblad, Olof Karis (currently director MAXIV), Laurent Duda,
  Carla Puglia, Anders Sandell
- Ph.D. students: **16**, present: Elin Cartwright, (8 female/8 male, 12 international)
- Postdocs: **3**, present: Fredrik Johansson (3 male)
- Researchers (permanent): **4**, present: Sergei Butorin, Ronny Knut, (4 male)
- Research engineers: **0**
- Senior Professors: **2**

Research focus

We do fundamental and applied condensed matter physics, to explore atomic-level functionality for renewable energy solutions. Our strategy is to develop and implement advanced X-ray photon science techniques and use them in emerging device research.

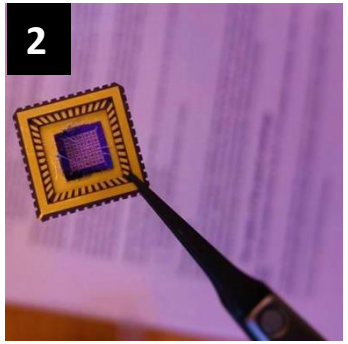
Main Research Areas		% of program	FTE Faculty	Type
1	Energy material physics and applications	30	2	Mixed
2	Quantum Materials & devices physics	10	0.33	Mixed
3	X-ray Methodologies & Instrumentation	30	2	Mixed
4	Fundamental research using X-ray photon science	20	0.66	Basic Science

1



Operando capabilities in-house and at larger infrastructures
e.g. our HAXPES/Kai Siegbahn lab

2

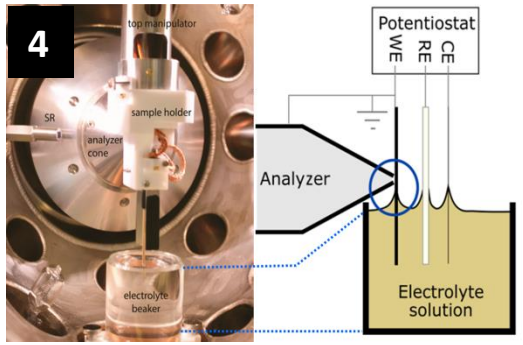


QUANTUM lab
HELIOS laser-lab

3

Numerous beamline developments

4



Surface, interface, bulk
Gas-Liquid-Solid
2D,3D, QD

UPPSALA UNIVERSITET

Key enablers for research

Integrated fundamental and applied research –physics of functional materials

- Competence and resources in both:
  WISE fellow, ERC, KAW, VR grants (about one/senior), Horizon 2030, WISE, COMPEL, STandUP, FORMAS, VINOVA, industry collaborations
- International recognition: Conference invitation/organisation, international collaborations, joint publications, leadership positions

Large scale facilities – apply and develop advanced X-ray methods, lead methodology development

- 35 beamtime weeks/year, Developing beamlines (Uppsala Berlin joint Laboratory, HIPPIE, VERITAS, SPECIES, FLEXPES)
- New HAXPES development at MAX IV (in TDR-stage), Current director of MAX IV in our program

Home-lab development – lower thresholds to collaborations and outreach - new

- HAXPES/Kai Siegbahn lab, Quantum lab, Helios lab
- LigHt (multi-method environment together with Material Physics), Dilution-refrigerator

Leadership & recruitment – evolve the programme, shape its environment, spread the methodologies

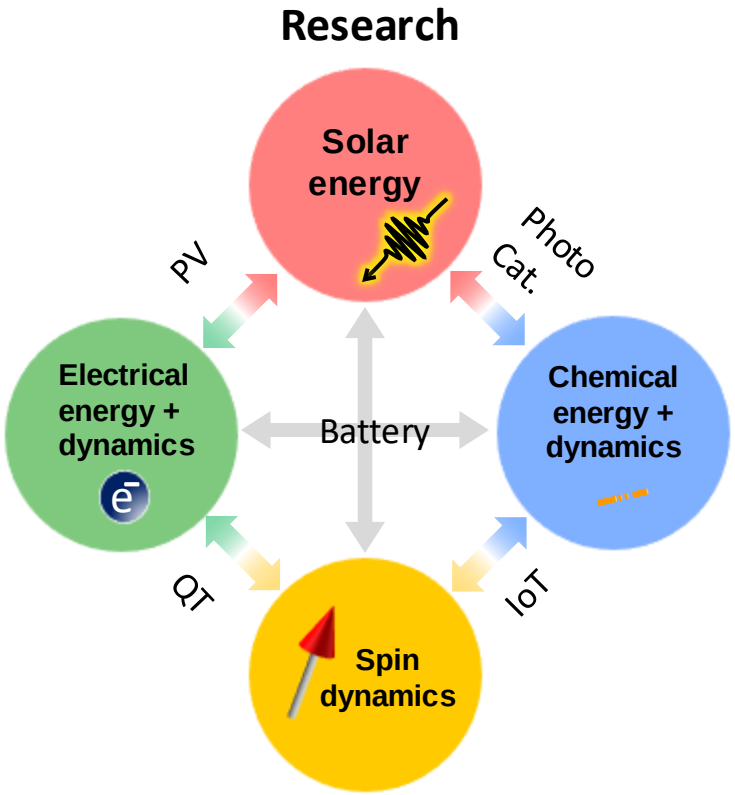
- WISE fellow, ERC consolidator, VR infrastructure grant, HAXPES activity in-house, at LigHt and MAX IV
- Leadership roles: COMPEL, WISE, Dept. leadership, Director of studies, Faculty educational board, International evaluation boards, ISP
- Renewal - Since last evaluation 4 new staff, 1 retirement, increase in no. PhDs, successful acquiring external grants (+50%)

Division of X-ray Photon Science (with Chemical and Biomolecular Physics)

- Forefront of X-ray methodology/instrumentation development, pooled resoures for admin, home-labs and teaching

Program priorities

(KoF24 report summary, Chapters 8-10)



- **Prio 1 (program):** Further strengthen the connection between fundamental and applied physics
  - Develop and implement advanced X-ray methodologies,
  - Integrating device research - energy materials, quantum technologies
- **Prio 2 (department):** Strengthen instrumentation and methodology development in-house and at large-scale facilities – operation of labs & resources for beamline development (*departmental priority*)
- **Prio 3 (faculty):** Strengthening a sustainability materials science platform (**LigHt**) for H or Li based clean energy systems, circular materials, and new technology solutions with young tenured staff. (*departmental priority*)

UPPSALA UNIVERSITET