Photocathode Physics for Photoinjectors Workshop

Report of Contributions

https://indico.bnl.gov/e/pppworkshop2010

Contribution ID: **0** Type: **not specified**

Requirements for Photocathodes for Photoinjectors

Tuesday, 12 October 2010 08:40 (40 minutes)

30 min. talk/10 min. questions
Extensive overview of requirements of the photocathodes, including specific requirements for pulsed FEL and high current ERL photoinjectors.

Presenter: DOWELL, David (SLAC)

Session Classification: Session 1 - Problem Formulation

Contribution ID: **1** Type: **not specified**

Updates From Facilities: ANL, BNL, Cornell, JLAB, LBNL, European Labs, Japanese Labs

Tuesday, 12 October 2010 09:20 (10 minutes)

10 min. kicks off the discussion to follow.
State what photocathodes are being worked on and for what application, existing equipment and capabilities. Each site to contribute 2 to 3 slides to the conveners.

Presenter: RAO, Triveni (BNL)

Session Classification: Session 1 - Problem Formulation

Contribution ID: **2** Type: **not specified**

Discussion

Tuesday, 12 October 2010 09:30 (2 hours)

Discussion charge: Update the table of requirements: pulsed versus high average current applications; table of available photocathode materials/labs with appropriate expertise; laboratory capabilities and techniques for photocathode characterization (including what's being planned and what's missing but would be nice to have).

Session Classification: Session 1 - Problem Formulation

Contribution ID: **3** Type: **not specified**

Thermal Emittance; Response Time; Lifetime Measurements

Tuesday, 12 October 2010 14:00 (30 minutes)

20 min. talk/10 min. questions
Overview of techniques, methods, limitations, etc. E.g. why some copper photocathode measurements report an emittance about x2 theory, while others basically agree with theory. Does this illuminate some error in thermal measurement?

Presenter: CULTRERA, Luca (Cornell Univ.)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **4** Type: **not specified**

Applications of Laser and Synchrotron Based ARPES to Photocathode Research

Tuesday, 12 October 2010 13:30 (30 minutes)

20 min. talk/10 min. questions

Presenter: RAMEAU, Jon (BNL)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **5** Type: **not specified**

Alphabet Soup - An Overview of Materials Techniques

Tuesday, 12 October 2010 11:30 (15 minutes)

15 min. talk

Presenter: SMEDLEY, John (BNL)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **6** Type: **not specified**

Cathode Recipes

Tuesday, 12 October 2010 11:45 (15 minutes)

15 min. talk

Presenter: VECCHIONE, Theodore (LBL)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **7** Type: **not specified**

In-Situ Quick Exafs

Tuesday, 12 October 2010 14:30 (30 minutes)

20 min. talk/10 min. questions

Presenter: ATTENKOFER, Klaus (ANL)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **8** Type: **not specified**

In-Situ Diffraction

Tuesday, 12 October 2010 12:00 (30 minutes)

20 min. talk/10 min. questions

Presenter: JORDAN-SWEET, Jean (IBM)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **9** Type: **not specified**

Discussion

Tuesday, 12 October 2010 15:00 (30 minutes)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **10** Type: **not specified**

MBE, ALD and XPS

Tuesday, 12 October 2010 15:45 (45 minutes)

30 min. talk/15 min. questions

Presenter: CHAMBERS, Scott (PNNL)

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **11** Type: **not specified**

Discussion

Tuesday, 12 October 2010 16:30 (1 hour)

Discussion charge: Proper measurement techniques of parameters relevant to accelerators; produce a list of measurement techniques that we can all agree on. Surface equipment/techniques available and desired for (to take most time). Photocathode growth and characterization. XPS, XRD, Topography, LEEM/PEEM, LEED/EBSD, SIMS, etc.–their application for understanding the structure and chemical form of the photocathodes, both initially and as a post mortum analysis. Substrate effects. New deposition techniques, such as ALD, with a focus on how they could help us grow better/more precisely engineered photocathodes.

Product: Cathode recipe list

Session Classification: Session 2 - Measurement of Relevant Cathode Parameters

Contribution ID: **12** Type: **not specified**

Modeling of Photoemission

Wednesday, 13 October 2010 08:30 (45 minutes)

40 min. talk/5 min. questions
To cover metals, antimonides, tellurides, NEA.

Presenter: JENSEN, Kevin (NRL)

Session Classification: Session 3 - Photoemission Physics I: Theory

Contribution ID: **13** Type: **not specified**

Physics of Semiconductor NEA Photocathodes

Wednesday, 13 October 2010 09:15 (35 minutes)

30 min. talk/5 min. questions

Presenter: SINCLAIR, Charles (Cornell Univ.)

Session Classification: Session 3 - Photoemission Physics I: Theory

Contribution ID: **15** Type: **not specified**

Photoemission Emittance

Wednesday, 13 October 2010 09:50 (35 minutes)

30 min. talk/5 min. questions

Presenter: SCHMERGE, John (SLAC)

Session Classification: Session 3 - Photoemission Physics I: Theory

Contribution ID: **16** Type: **not specified**

Discussion

Wednesday, 13 October 2010 10:40 (1h 50m)

Discussion charge: Is 3 step Spicer model sufficient to explain practical photocathodes? If not, what are the limitations? pros/cons of each family–what knobs exist to tune the performance: QE vs. wavelength, better lifetime, faster response, lower thermal emittance; what physics parts are poorly understood and need a better theory effort; semiconductor properties needed for quantitative agreement with measurements, how to measure/calculate.

Session Classification: Session 3 - Photoemission Physics I: Theory

Contribution ID: **17** Type: **not specified**

In-room Lunch

Wednesday, 13 October 2010 12:30 (1 hour)

Session Classification: Session 3 - Photoemission Physics I: Theory

Contribution ID: **18** Type: **not specified**

Multiscale 3D Simulations of Charge Gain, Transport, and Collection Efficiency in Diamond

Wednesday, 13 October 2010 13:30 (40 minutes)

30 min. talk/10 min. questions

Presenter: DMITROV, Dimitre (Tech-X)

Session Classification: Session 4 - Photoemission Physics II: Agreement with Measurements

Contribution ID: **19** Type: **not specified**

Superlattice photocathode development for low emittance

Wednesday, 13 October 2010 14:10 (40 minutes)

30 min. talk/10 min. questions
Model approaches and predictions, comparison with data, search for the optimal combination of thermal emittance and response time from NEA.

Presenters: Dr KUWAHARA, Makoto (Nagoya Univ.); Prof. YAMAMOTO, Masahiro (KEK)

Session Classification: Session 4 - Photoemission Physics II: Agreement with Measurements

Contribution ID: **20** Type: **not specified**

Hybrid Insulator/Semiconductor - Metals and CsBr Coatings

Wednesday, 13 October 2010 14:50 (20 minutes)

30 min. talk/10 min. questions

Presenter: MALDONADO, Juan (SLAC)

Session Classification: Session 4 - Photoemission Physics II: Agreement with Measurements

Contribution ID: **21** Type: **not specified**

Discussion

Wednesday, 13 October 2010 15:10 (2h 20m)

Discussion charge: What measurements are out there, what's missing; agreement of theory vs. existing measurements for a) QE vs. wavelength; b) thermal emittance; energy spectra; c) response time; identify (additional) conditions/requirements for controlled experiments for benchmarking with modeling.

Session Classification: Session 4 - Photoemission Physics II: Agreement with Measurements

Contribution ID: **22** Type: **not specified**

Multiphoton Emission

20 min. talk/5 min. questions
MgF2 coated Cu Cathode for longer limetime? Multiphoton photoemission from semiconductors? Anything else interesting from UCLA.

Contribution ID: **23** Type: **not specified**

Multiphoton Emission

20 min. talk/5 min. questions
MgF2 coated Cu Cathode for longer lifetime? Multiphoton photoemission from semiconductors? Anything else interesting from UCLA.

Contribution ID: **24** Type: **not specified**

Multiphoton Emission

20 min. talk/5 min. questions
MgF2 coated Cu Cathode for longer lifetime? Multiphoton photoemission from semiconductors? Anything else interesting from UCLA.

Contribution ID: **25** Type: **not specified**

Multiphoton Emission

20 min. talk/5 min. questions
MgF2 coated Cu Cathode for longer lifetime? Multiphoton photoemission from semiconductors? Anything else interesting from UCLA.

Contribution ID: **26** Type: **not specified**

Prospects of New III-V Photoemissive Materials Including Ternary and Quantum Lattice

20 min. talk/5 min. questions
Prospect for multilayers to achieve lower emittance and longer lifetime.

Contribution ID: **27** Type: **not specified**

Multiphoton Emission

Thursday, 14 October 2010 09:00 (30 minutes)

25 min. talk/5 min. questions
MgF2 coated Cu Cathode for longer lifetime? Multiphoton photoemission from semiconductors? Anything else interesting from UCLA.

Presenter: MUSUMECI, Pietro (UCLA)

Session Classification: Session 5 - New Ideas and Future Collaborations

Contribution ID: **29** Type: **not specified**

New Activation with K/Cs for Better Stability and Lifetime?

Thursday, 14 October 2010 09:30 (30 minutes)

25 min. talk/5 min. questions

Presenter: SUN, Steven (SLAC)

Session Classification: Session 5 - New Ideas and Future Collaborations

Contribution ID: **30** Type: **not specified**

Work Function Lowering and Ponderomotive E-Acceleration for Ultra Low Emittance Beams

Thursday, 14 October 2010 10:00 (30 minutes)

25 min. talk/5 min. questions

Presenter: NEMETH, Karoly (ANL)

Session Classification: Session 5 - New Ideas and Future Collaborations

Contribution ID: **31** Type: **not specified**

Plasmonic Interactions in Metallic Nanostructures

Thursday, 14 October 2010 08:30 (30 minutes)

25 min. talk/5 min. questions

Presenter: PADMORE, Howard (LBL)

Session Classification: Session 5 - New Ideas and Future Collaborations

Contribution ID: **32** Type: **not specified**

Discussion

Thursday, 14 October 2010 10:45 (1h 45m)

Discussion charge: Manufacturer's/lab's capabilities with regards to new material growth; sharing resources for a) photocathode prep recipes; b) measurement equipment. User facilities for photocathode research (e.g. to measure thermal emittance/response time). Testing of materials in the actual photoguns. Discussion on the repository.

Session Classification: Session 5 - New Ideas and Future Collaborations

Contribution ID: **33** Type: **not specified**

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Contribution ID: **34** Type: **not specified**

Adjourn

Thursday, 14 October 2010 12:30 (0 minutes)

Contribution ID: **35** Type: **not specified**

BNL Facilities Tours

Thursday, 14 October 2010 14:00 (0 minutes)