

Summery of SLOPOS-11

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- Statistics
- Positron Beam Facilities
- Technical Improvements
- Applications
 - in Semiconductors
 - in Metals / Alloys
 - In Polymers /Molecular Solids
 - In Nanomaterials
 - Thin Films and Interfaces
- Round Table Discussion
- Conclusions



Important remarks: 1) Most of the posters were not considered for this summery
2) Sorry for those contributions which were not mentioned (only due to lack of time)



SLOPOS-11: Statistics

- 110 participants from 20 countries
- 22 invited Talks - 35 oral talks
- Round table discussion
- about 50 posters in 2 poster sessions
- a lot of discussions
- 7 coffee breaks and a lot of wine/beer in the evenings ;-)



Positron Beam Facilities

- **NEPOMUC at FRM-II / Garching @ Munich**
 - 5 beamlines under construction; 4 already in use; new remoderator
 - Good news: PLEPS is running now; very fast!
- **Argonne Project APosS**
 - 15.5 MeV, 0.1 μA , 60 Hz
 - First positrons detected - up to 3×10^9 e^+ /s expected
- **Helsinki Pulsed Positron Beam at HUT**
 - Timing problems solved, isolation problems considered - first lifetime results to be expected soon
- **SOPHI Project in Saclay - Mini LINAC for Gravity Experiment with Anti-H**
 - Tabletop commercial accelerator: 6 MeV, 300 Hz, 0.2 ma; 10 kW
 - Under construction (solid Ne moderator possible)
 - Aim 10^8 e^+ /s



Positron Beam Facilities

- **Positron Microbeam for Transmission Positron Microscope at KEK** (large Japanese Collaboration)
 - 60 μm diameter after remoderation
 - Amazing results for Ni transmission moderator (up to 20% efficiency)
- **Positron Beam at IHEP Beijing China**
 - Many promising activities: lifetime, AMOC, CDBS
 - Isotope and LINAC-based bunched slow positron beams
- **Positron Probe Micro Analyser (PPMA) at AIST** (Tsukuba)
 - 100 μm beam (10 μm expected); lifetime; 200...300 s/ pixel; 200ps FMHM expected
- **Australian Positron beam Facility**
 - 2 beam lines: materials science & atomic/bio/molecular
 - AMO beam line: Pulsed; rare gas moderator; 25 meV energy resolution expected
 - Materials beam line under construction; aim: bunched 200ps FWHM; 10^7 e⁺/s
- News from **ATHENA / ALPHA** at CERN: trapped neutral Anti-H; special trap



Positron Beam Facilities

- **EPOS: ELBE Positron Source @ Rossendorf / Dresden**
 - 40 MeV, 1 mA, 13 MHz repetition time in cw mode
 - Retain original time structure for simplicity and best time resolution
 - Test in Halle; almost ready for setup in Rossendorf
- News from **Washington State University** Positron facilities; how to store positrons?
- Poster BP1: **e^+ -Microbeam JAEA** in Takasaki (3,4 μm using aperture); similar to Bonn system; soon pulsing system
- New magnetically guided slow positron **beam in Taiwan** (Chung Yuan Christian Univ.)



Technical Improvements

- **Advanced Background subtraction** of Doppler spectra -> no coincidence needed
- **Defect mapping** at Cu plates
- Gas moderation & **W-remoderator** at NEPOMUC
- Attempt to get **polarized positron beam** - source modification necessary (Be source carrier to minimize reflection)
- **"Quantum Beats"** - in 3γ -annihilation decay of o-Ps by Perturbed angular Correlation in magnetic fields: What can we learn about the material?
- **PAES:**
 - Cu_2O & new TOF spectrometer
 - Metal coated Si and Cu; 2h acqu. Time (1min expected); TOF?



Applications - Semiconductors

- **ZnO**: near-surface damage; O-Vacancies by reversible annealing; N-implantation
- **Si**: Implantations; H/D/He for ion cutting (blistering and cratering);
- **Ge**: H-plasma induced defects; not much done for Ge in the moment...
- **Si Photonics**
- **SiC**: Au implantation $V_{Si}-V_c$ at low fluence, Si-nano particles at high fluence
- **Useful vacancies**: co-implantation of F to B in Si - B-diffusion much slower
- **Theory**: useful for estimation of lifetime, high-momentum distribution, charge state of defects ...



Applications - Metals

- Very good tutorial talk: diffusion & trapping - **embedded nano-particles** Fe-Cu (Y. Nagai)
- **Al alloys:**
 - New: self-healing of AlCuMg
 - Atomic structure of pre-GPZ (simulations & Exp.); combination with X-Ray methods
- **Positron trapping at grain boundaries:** simulation & measurements in Ni, Fe
- **He/H-irradiation of Fe**
- **Mg / Mg-alloys:** implantation defects
- **Ps⁻** from W surfaces; Ps⁺ possible ?



Applications - Nanoporosity

- **Ps formation and Porosity depth-profiling:**
 - spin-coated silica thin films
 - TEOS-films (lifetime depend also on pore surface chemistry)
 - Polyamide thin films (Membranes)
 - gamma-irradiated polymers
 - Epoxy resins
- Self-supporting **PMMA-nm-films** to get constants n , α in depth-profile equation
- **2D-Positron lifetime analysis** of porous films (lifetime versus pulse height)
- Applications of **Beams** to Ps-forming surfaces (combining PALS & DB; depth dependence)
- **Capping** of porous layers was extensively discussed



Round Table Discussion

- we had a short round table discussion
- some important points:
 - SLOPOS-12 will be held in Australia in 2010 (SLOPOS-13 possibly in India)
 - PSSD workshop series shall be revitalized as PSD-2008 (Positron Studies of Defects) - PSD should be a separate workshop in PPC-year of 3-years positron conference cycle - thus: ICPA - SLOPOS - PPC/PSD
 - PPC-9 was announced to be held in Wuhan/PR China, 11.-15. May 2008;
<http://aff.whu.edu.cn/whuppc9/>
 - Responsibility for www.PositronAnnihilation.net has been transferred according to the decisions of the Intern. Advisory Committee of ICPA to the organizers of the next ICPA: Prof. Nambissan @ Calcutta / India (pmg.nambissan@saha.ac.in)



Conclusions

- a lot of promising beam projects on the way in all over the world
- very important for improvement of our contributions:
 - lifetime required - pulsed beams most important
 - micro-beams will open new fields of investigation
 - comparison with other methods to win even more confidence
 - use as many variable parameters as possible: temperature, light, cap layer, fields, lateral position ...
- we shall not only attend positron meetings, but all the specialized conferences

