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Planned Experiments with the Pulsed Positron Beams PLEPS and SPM

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The pulsed positron beams PLEPS and SPM are user facilities at the intense positron source NEPOMUC for defect depth-profiling by means of positron lifetime measurements.

PLEPS uses a monochromatic pulsed positron beam of variable implantation energy and 1 mm diameter. It enables a quantitative and non-destructive characterization of open volume defects, e.g. vacancies, grain boundaries, precipitates or vacancies clusters close to surfaces and in thin films (< 30 nm) and layered structures. With PLEPS in situ manipulation of the sample is possible: The sample temperature can be varied between 80 K and 600 K. With a new broad band illumination system optically active defects can be detected and identified by manipulating their charged states. Positron drift experiments to explore interfaces and internal surfaces can be performed by applying bias voltages to the samples. Typical applications comprise the defect identification in semiconductors and insulators, the investigation of irradiation induced defects in materials for fusion and fission, as well as the characterization of nano-voids in glasses, polymers and polymeric membrane layers.

The positron microscope SPM enables in addition to depth profiling to scan and focus the pulsed beam onto a sample with spot sizes in the range of 1 μm . The lateral resolution allows to investigate 3-dimensional defect distributions. The SPM is in the final stage of commissioning and will be operated in the near future.

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