New possibilities in high sensitivity Low Energy Ion Scattering (LEIS) for probing the outermost atomic layer — THOMAS GRIEHl, EWALD NieHUS, RIK TER Veen, and HIDDLE BRONGERMAs — 1ION-TOP GmbH, Heisenbergstr. 15, 81419 Münster, Germany — 2Calipso BV, Den Dolech 2, 5612 AZ Eindhoven, The Netherlands

With a recently developed high sensitivity Low Energy Ion Scattering (LEIS) instrument, a range of new applications arises for this extremely surface sensitive analytical technique. Known capabilities of LEIS are the selective characterisation and quantification of the atomic composition of the outermost atomic layer, i.e. precisely the atoms that control properties like catalytic performance, adhesion, wetting, corrosion, etc.

New possibilities such as surface imaging, sputter as well as non-destructive (static) profiling and even higher sensitivity for light elements have been added. The energy range of the primary ion source of up to 8 keV allows an improved mass resolution, thus enabling a better separation of the heaviest elements. In addition, a time-of-flight filter dramatically improves the detection limit for light elements. This filter suppresses the signal arising from sputtered ions, while scattered ions reach the detection system unhindered.

In this contribution, we show the utilization of these new capabilities to a range of samples and applications. Furthermore, we will show how LEIS can benefit from the combination with the complementary technique Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS), which adds ppb - ppm sensitivity, lateral resolution of 100 nm and chemical information.

Non-destructive probing of the chemical state of buried TiO$_2$ nanolayers — BEATRIX POLLAKOWSKI, BURKHARD BECKHOFF, STEFAN BRaUN, PETER GawILLITZA, FALK REINHARDT, and GERHARD ULML — 1Physikalisch-Technische Bundesanstalt, Abbestr. 2-12, 10587 Berlin — 2Fraunhofer Institut Werkstoff- und Strahltechnik, Winterbergstr. 28, 01277 Dresden

Near edge x-ray absorption fine structure (NEXAFS) in combination with grazing incidence x-ray fluorescence (GIXRF) analysis provides a good approach for a depth-sensitive characterization of buried nanolayers with respect to both elemental composition and speciation. This idea offers the specific advantage of a high tunability of the information depth. The GIXRF regime implicates the occurrence of the x-ray standing waves (XSW) field above, at and below the surface affecting directly influence on the total fluorescence yield (TFY). The XSW field and the resulting mean information depth are dependent on incident angle and photon energy. The variation of the photon energy during a NEXAFS study requires to correct the incident angle to keep the mean information depth constant. The sample system consists of several 30 nm Ti nanolayers oxidized to different extents and being buried below 5 nm C. The results of angular corrected Ti L$_{2,3}$ NEXAFS spectra exhibit an electronic structure presumably comparable to that measured in total electron yield (TEY) and confirm the potential of this method. GIXRF-NEXAFS provides a complementary approach to different non-destructive techniques based on electron detection, which can reach their limits for deeply buried thin layers.

ToF-SIMS Analysis of thin Al$_{1-x}$Si$_x$O$_y$ layers — P. MICHAKLowski, G. JASCHKE, JENS STEINHOFF, and STEFFEN TECHERT — 1Fraunhofer Center Nanoelektronische Technologien, Dresden — 2Qimonda, Dresden

Recent interest in manufacturing new generation of memory devices based on high-k materials requires parallel development of proper analytic techniques. This work focuses on Secondary Ion Mass Spectrometry (SIMS) measurements on atomic layer deposited Al$_{1-x}$Si$_x$O$_y$ composite materials in form of thin films in range of 5-20 nm. SIMS is a very sensitive method for contamination monitoring. Based on standards created with Rutherford Backscattering Spectrometry (RBS) SIMS proved to be useful for identification of the composition of unknown samples. Recent measurements are aimed to determine the structural and chemical information of the material during the annealing under different temperature conditions. SIMS is a very promising technique for multi-purpose characterization of different materials and further optimization of measurement conditions and proper interpretation of results will be performed.
tions have been performed within a multiple scattering cluster model in order to obtain the lattice parameters. An r-factor analysis indicates that the MnO films exhibits a tetragonal distortion and relaxes step by step to bulk MnO with thicker films. In addition we are able to show the relaxation in dependence on the film thickness.


C:Co and C:V nanocomposites exhibit a fine-grained structure at deposition temperatures below 300°C. At higher temperatures C:Co films tend to form nanocolumns, whereas the globular structure is preserved for C:V. X-ray patterns show low degree of crystallinity of the nanoparticles in C:Co and C:V composites.

Raman spectroscopy results show that the presence of metal significantly enhances the formation of aromatic clusters. This enhancement occurs independently on metal nanoparticle size, shape and phase.