

New record milestone in sub-Angstrom e-beam imaging

Carl Zeiss SMT - Nano Technology Systems Division announces a major break-through by achieving a record image resolution of 0.8 Angstrom (0.08 nanometer) during qualification of its latest generation ultra-high-resolution transmission electron microscope (UHRTEM).

The milestone was achieved using a newly developed 200kV field-emission UHRTEM equipped with electron optical components for aberration correction, electron beam monochromatization and energy filtered imaging, partly co-developed with CEOS GmbH, Heidelberg. By unique and proprietary integration of these advanced components into a revolutionary new UHRTEM platform, image resolution of even down to 0.7 Angstrom was demonstrated for certain image directions which nearly equals the theoretically achievable resolution limit (one Angstrom is a tenth of a nanometer, while a nanometer is one billionth of a meter). The TEM instrument is specifically designed for sub-Angstrom characterization of advanced materials and device structures, e.g. for atomic scale analysis of transistor gate areas, and will be made available to demanding customers in cutting-edge nanotechnology research and development.

"We are highly impressed by the latest results in high-resolution TEM development achieved by Carl Zeiss SMT. Especially combined with its proprietary energy filter technology this tool combines resolution and analytical capabilities required for successful process development and control of leading edge IC devices for current and future technology generations", stated Dr. Udo Nothelfer, Vice President AMD Fab30 Dresden.

"In addition to semiconductor industry requirements, artifact-free imaging at utmost resolution will also serve the world's growing nanotechnology community to characterize new devices and materials down to the

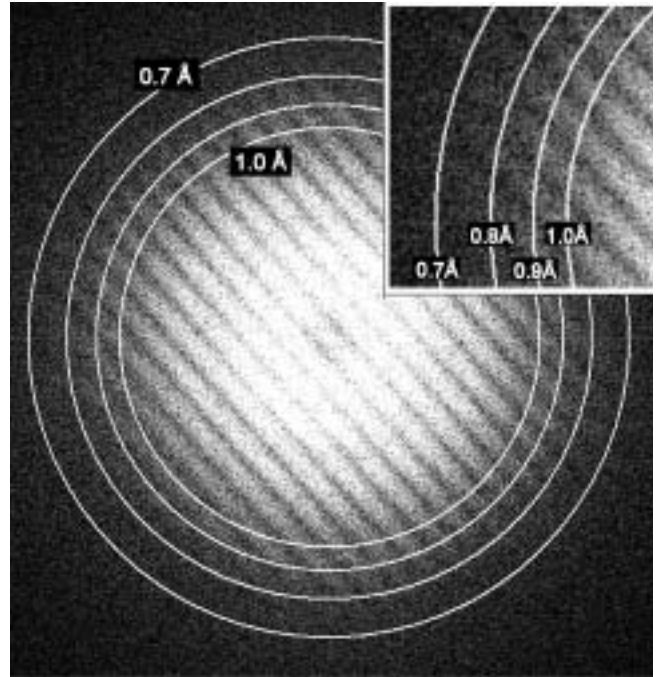


Fig. 1: Young's fringe pattern revealing useable image resolution of 0.8 Angstrom. Inset shows image resolution of even down to 0.7 Angstrom for certain image directions, nearly equaling the theoretically achievable resolution limit.

atomic scale and even below, especially where non-periodic structures like crystal defects and interfaces become of increasing significance. By development of our sub-Angstrom resolution TEM, we enable our most demanding customers to enter the "magic" sub-Angstrom regime defining the key properties of materials", stated Jan Vermeulen, Marketing Director of Carl Zeiss SMT.

For demonstration of the achieved image resolution, Young's fringes patterns (as exemplified in the picture) have been generated from micrographs recorded at 800,000 times image magnification and image acquisition times of one second. The energy spread of the field emission source was reduced by the monochromator to 0.2 eV and a residual spherical aberration of the objective lens

(Cs value) of approximately $-3\mu\text{m}$ was obtained using the integrated aberration corrector from CEOS GmbH. An amorphous Tantalum thin film was used as specimen. Four ring insets, calibrated by gold lattice reflections, indicate the 1.0, 0.9, 0.8 and 0.7 Angstrom resolution limits (from inside to outside). For all image directions, the fringe contrast clearly extends to the 0.8 Angstrom ring and even extends to the 0.7 Angstrom ring for certain image directions.

Global Solution Provider

The Nano Technology Systems Division of Carl Zeiss SMT provides its customers with total solutions featuring the latest leading-edge EM technology. The company's extensive know-how, meticulously acquired over 60 years in the field of E-beam technology, has brought many pioneering innovations to the market. Our global applications and service network guarantees fast, reliable and high quality support sharply focused on customer requirements. Combined with dedicated upgrade strategies, this will protect your investment for its entire lifetime. The core technology embedded in our innovative products enables us to provide solutions which add value to our customers' business.

Enabling the Nano-Age World®



Fig. 2: Carl Zeiss SMT's newly developed sub-Angstrom UHRTEM with revolutionary column suspension concept.

Carl Zeiss NTS GmbH

A Carl Zeiss SMT AG Company
 Carl-Zeiss-Str. 22
 73447 Oberkochen
 Germany
 Tel. +49 73 64 / 20 44 88
 Fax +49 73 64 / 20 43 43
 info-nts@smt.zeiss.com

Carl Zeiss SMT Ltd.

511 Coldhams Lane
 Cambridge CB1 3JS
 UK
 Tel. +44 12 23 / 41 41 66
 Fax +44 12 23 / 41 27 76
 info-uk@smt.zeiss.com

Carl Zeiss SMT Inc.

One Zeiss Drive, Thornwood
 New York 10594
 USA
 Tel. +1 914 / 747 7700
 Fax +1 914 / 681 7443
 info-usa@smt.zeiss.com

Carl Zeiss SMT Sarl

Zone d'Activité des Peupliers
 27, rue des Peupliers - Bâtiment A
 92000 Nanterre
 France
 Tel. +3 31 41 / 39 92 10
 Fax +3 31 41 / 39 92 29
 info-fr@smt.zeiss.com

Plus a worldwide network
 of authorised distributors

www.smt.zeiss.com/nts