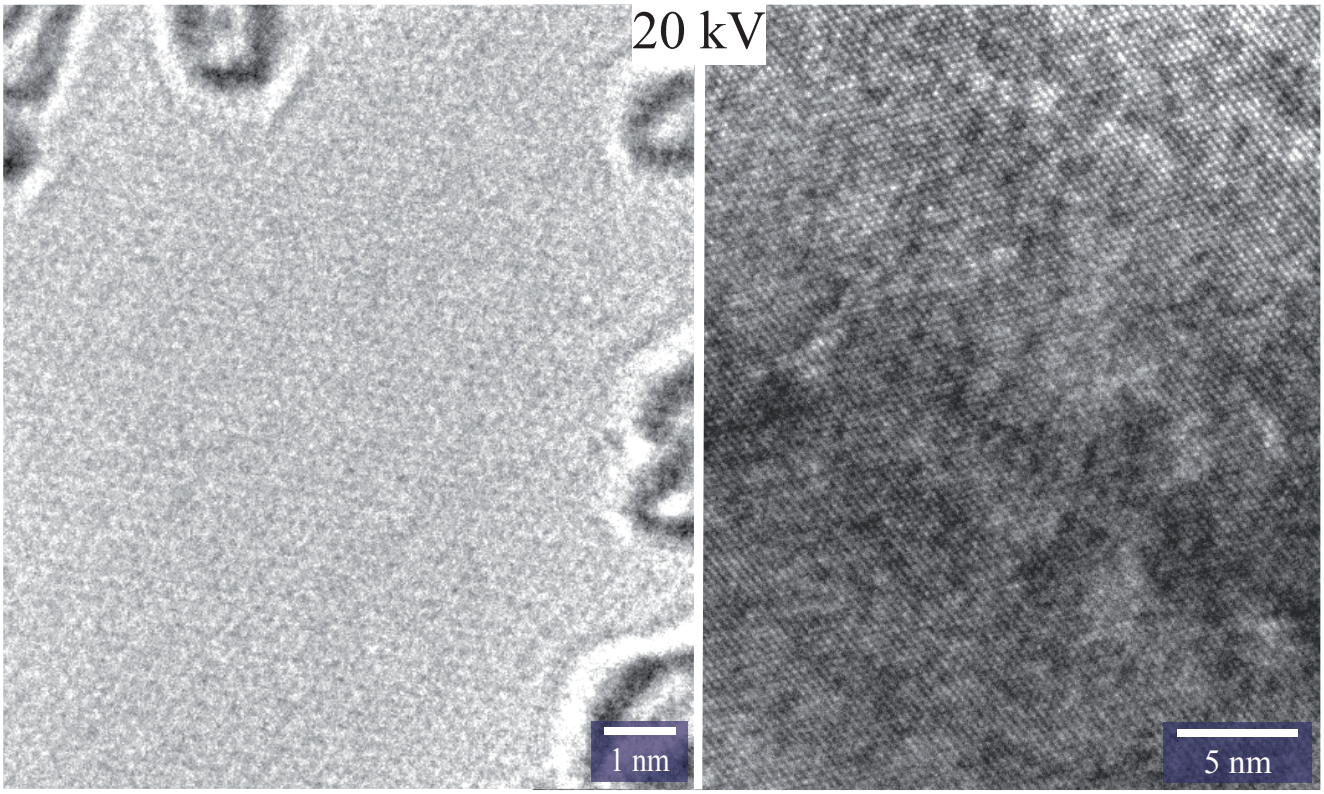

Figure 1: First C_S-corrected measurements at 20 kV: HR-TEM images left: graphene (tilted illumination), right: Si [110]

High Resolution at 20 kV

A Demonstration of Low-Voltage TEM Performance

July 2010 - For the first time we present at 20 kV operation voltage highresolution images of graphene and silicon showing the transfer of 272 pm lattice fringes. The instrument used for this investigation is based on the LIBRA® 200 TEM platform, which was equipped with a spherical aberration corrector for the objective lens and a monochromator for the electron gun. The alignment of the instrument was optimized for high-resolution operation at 20 kV.

Fig. 1 illustrates the high-resolution performance of the microscope at 20 kV accelerating voltage using graphene and silicon as standard samples. The 314 pm and 272 pm lattice fringes are clearly resolved. An essential component in achieving this result was the reduction of the energy spread of the source enabled by the integrated electrostatic monochromator. The silicon specimen used for this image had a thickness of approximately 4 nm and was prepared in a NVision CrossBeam® (FIB-SEM) system.

The development is done within the framework of University Ulm's SALVE (Sub-Angstrom Low Voltage Electron Microscopy) project (project leader: Prof. U. A. Kaiser, UUlm). Carl Zeiss Microscopy is the project partner for the instrument development and CEOS GmbH (Heidelberg) for the aberration corrector development and the monochromator. The project is financially supported by the German Research Foundation (DFG) and the Ministry of Science, Research and the Arts (MWK) of the state of Baden-Wuerttemberg. SALVE partners have one goal in mind: making it possible to study radiation-sensitive (soft and hard matter) materials at ultra-high-resolution by means of transmission electron microscopy (TEM).

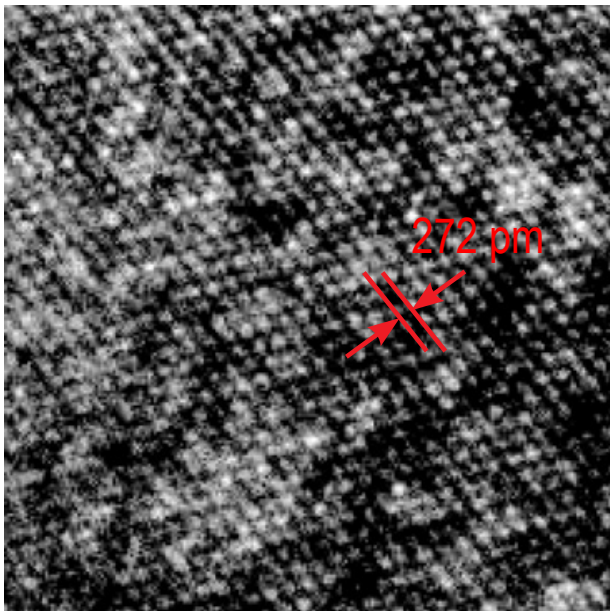

Figure 2: Silicon sample from Fig. 1 right. Lattice fringes can be clearly seen which indicate a transfer up to 272 pm.

Text originally published by Prof. Ute A. Kaiser, University of Ulm, Germany and Dr. Simone Pokrant, Carl Zeiss Microscopy GmbH, Germany at http://www.zeiss.com/C125790B002DE47E/0/495C67703751EE09C125790300679E4D/$FILE/EN_40_011_075_high_resolution_at_20kv_low-voltage_tem.pdf