Coherent Electron Imaging Based on a Single-Atom Electron Source

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Over the past several years, we have been developing low-voltage (80−5000 V) coherent electron imaging techniques. An advantage of this approach is that there is a possibility to achieve diffraction-limited resolution without the need to fabricate a high-quality lens. Coherent diffractive imaging has been successfully demonstrated in optical microscopy and x-ray microscopy. There are relatively fewer experiments in electron microscopy mainly because optical lasers and synchrotron light sources are usually considered to possess better coherence than electron sources. Now we have demonstrated full spatial coherence for single-atom electron sources. Thus coherent imaging based on single-atom electron sources is very promising to reach atomic resolution even for nonperiodic structures such as biological molecules. Our ultimate goal is to achieve high-contrast and high-spatial-resolution imaging of two-dimensional materials and organic molecules under low-dose conditions.

EDUCATION

1993 Applied Physics, Division of Applied Science, Harvard University
Ph.D.

1984 Department of Electrical Engineering, National Taiwan University, Taiwan
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EXPERIENCE

2005– Adjunct Professor, Department of Material Sciences and Engineering, National Tsing-Hua University

2000– Research Fellow, Institute of Physics, Academia Sinica

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1998– Associate Research Fellow, Institute of Physics, Academia Sinica.

1994– Assistant Research Fellow, Institute of Physics, Academia Sinica

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AWARD

1999 Young Investigator Award, Academia Sinica.

2000 Outstanding Research Award, National Science Council.

2006 Outstanding Nano-tech Research Award, Taiwan Nanotechnology Industry Development Association.

The main research interests of Dr. Ing-Shouh Hwang are on surface and interface sciences, scanning probe microscopy, electron/ion beam techniques, development of new instrumentation techniques.