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EXPANDED ISSUE

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MRS Bulletin

MRS MATERIALS RESEARCH SOCIETY
Advancing materials. Improving the quality of life.

Graphene

Fundamentals and Functionalities

CAMBRIDGE UNIVERSITY PRESS

MRS BULLETIN

Graphene: Fundamentals and functionalities

December 2012

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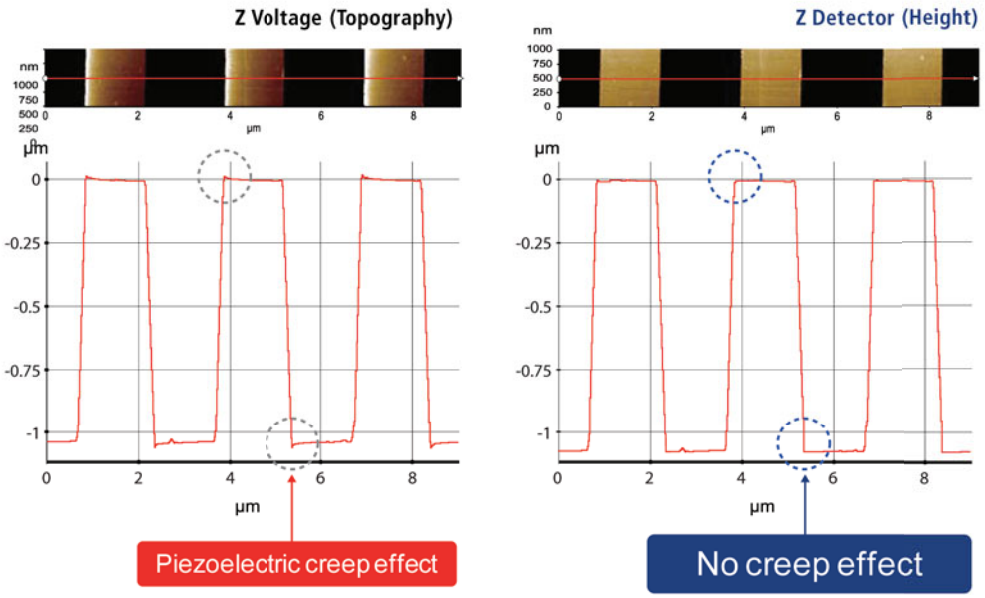

Sample: 1.020 µm Step Height (9 µm x 1 µm, 2048 pixels x 128 lines)

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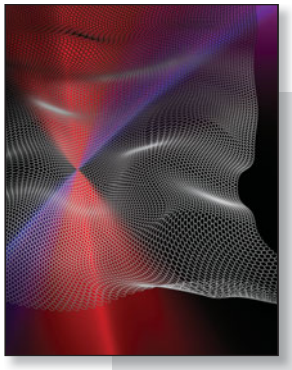
LANDSCAPE



ON THE COVER

Graphene: Fundamentals and functionalities. With its two-dimensional single-atomic monolayer honeycomb lattice of carbon atoms in an sp^2 hexagonal bonding configuration, graphene offers unique properties. Research on graphene has exploded over the past decade due to its ease of availability through exfoliation and epitaxial growth, as well as extensive experience with carbon nanostructures from the previous two decades. The articles in this expanded issue of *MRS Bulletin* demonstrate the large impact of graphene on materials science, highlighting the newest advances, challenges, applications, and future directions. The cover shows an artist's rendition of the graphene monolayer structure, with its unique electronic band-structure in the background showing zero energy gap at the Dirac point between the vacant conduction band and the electron-filled valence band, indicated by the Dirac cones. See the technical theme that begins on page 1119.

FUNDAMENTALS

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FUNCTIONALITIES

FUTURE PERSPECTIVES

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About the Materials Research Society

The Materials Research Society (MRS), a not-for-profit scientific association founded in 1973, promotes interdisciplinary goal-oriented basic research on materials of technological importance. Membership in the Society includes almost 16,000 scientists, engineers, and research managers from industrial, government, and university research laboratories in the United States and over 80 countries.

The Society's interdisciplinary approach differs from that of single-discipline professional societies because it promotes information exchange across the many technical fields touching materials development. MRS sponsors three major international annual meetings encompassing approximately 125 topical symposia, and also sponsors numerous single-topic scientific meetings. The Society recognizes professional and technical excellence and fosters technical interaction in local geographic regions through Sections and University Chapters.

MRS participates in the international arena of materials research through the International Union of Materials Research Societies (IUMRS). MRS is a member of the Alliance for Science & Technology Research in America and is an affiliate of the American Institute of Physics.

MRS publishes The MRS Online Proceedings Library, *MRS Bulletin*, *Journal of Materials Research*, *MRS Communications*, and other publications related to current research activities.

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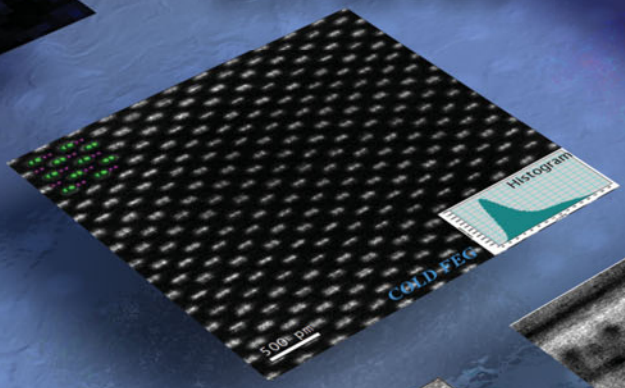
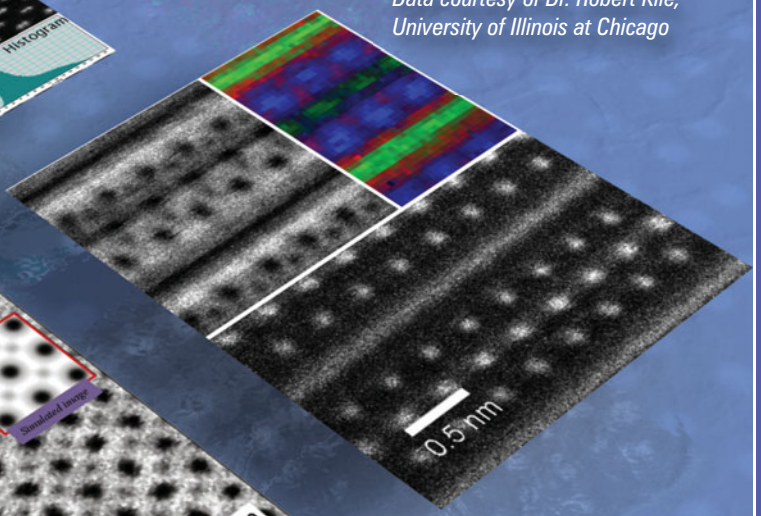
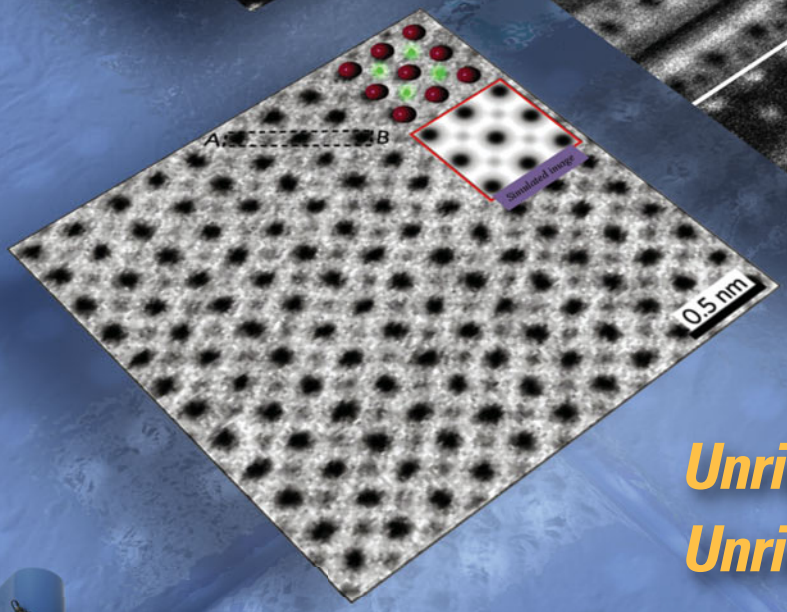


ABF, HAADF and EELS
$Ca_3Co_4O_9$ (110)
Data courtesy of Dr. Robert Klie, University of Illinois at Chicago





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Visualization of hydrogen atomic columns in YH_2 by ABF imaging (Y = red, H = green) *Data courtesy of Ryo Ishikawa and Dr. Eiji Abe (The University of Tokyo)*

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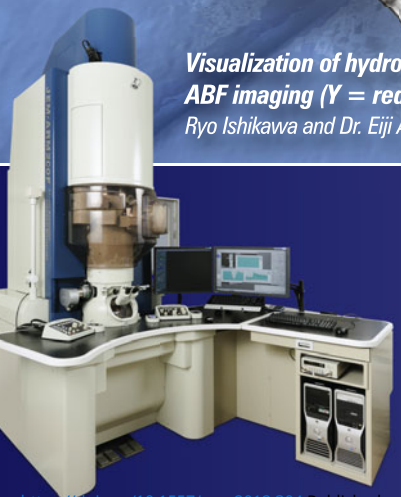

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