

MRS Publishes Proceedings of Workshop on Tungsten and Other Refractory Metals for VLSI Applications

The Materials Research Society has published the proceedings of the second annual Workshop on Tungsten and Other Refractory Metals for VLSI Applications in a special hardbound volume. The volume contains the papers presented at the second Workshop, held October 9-11, 1985 at Sandia National Laboratories, Albuquerque, NM, as well as key papers presented at the first Workshop held at Sandia in 1984.

Because tungsten is self-aligning when applied by low-pressure CVD (LPCVD), it simplifies the problem of devising diffusion barriers to protect electrical contacts between Si diffusions and Al interconnects. Also, its electrical conductivity is several times higher than that of tungsten silicide and other similar high-melting point metal compounds being considered for use in advanced microcircuits. Because it can be deposited in a self-aligning manner, area-selective LPCVD tungsten is also being adapted for applications such as source flash drain covers, via fills and low resistance shunts on polysilicon lines.

The highly successful Workshop series, chaired by Robert S. Blewer of Sandia National Laboratories, attracted more than 100 scientists and engineers from 51 U.S. and nine foreign companies. The 34 papers published in the proceedings cover selective deposition of tungsten—past and present, recent developments in LPCVD tungsten, fundamental studies of LPCVD tungsten films, properties of CVD tungsten films

deposited at atmospheric and reduced pressures, adhesion of tungsten films to dielectrics, the influence of dopants and silicon dioxide on the reduction of WF_6 by silicon and hydrogen, practical aspects of LPCVD tungsten, properties of blanket tungsten films deposited by sputtering and LPCVD, devices and techniques, electrical properties of tungsten films on silicon, and properties of refractory metal films on GaAs. The keynote paper, presented by Pallab Chatterjee, director of VLSI Design at Texas Instruments, is entitled "Interconnects and VLSI—A Device Designer's Perspective."

Papers from the 1984 Workshop included in the volume total 25, and cover LPCVD tungsten techniques; source gas purity, analysis, and flow control; properties and characteristics of tungsten films; tungsten/silicon interaction; modeling; device applications; and the future of refractory metals in VLSI applications. The keynote paper, by A. N. Saxena, Gould/AMI, is entitled "VLSI Multilevel Metallizations: The Role of Tungsten."

Sandia National Laboratories organized the 1985 Workshop jointly with the University of California-Berkeley's University Engineering Extension to gauge interest in this technology, to identify laboratories in this field, and to provide an opportunity for those beginning research in this area to exchange results. The 1985 Workshop was twice the length of the 1984 Workshop to

accommodate the growing amount of new information and interest in tungsten for VLSI applications.

The volume marks the first time that MRS has published the proceedings of a conference which was not sponsored by MRS. The 59 contributed and reviewed papers contained in this volume represent more than 75% of the research published on LPCVD tungsten in the last five years. The book thus represents a valuable contribution to the literature on materials research for integrated circuits, and serves as an important reference book for members of the Society and others involved in materials research in the semiconductor industry.

The book, *Tungsten and Other Refractory Metals for VLSI Applications*, can be ordered from MRS at the following prices:

Until April 30, 1986:

MRS members—\$29

U.S. nonmembers—\$34

Foreign nonmembers—\$40

After April 30, 1986:

MRS members—\$34

U.S. nonmembers—\$39

Foreign nonmembers—\$45

Order from Publications Department, Materials Research Society, 9800 McKnight Road, Suite 327, Pittsburgh, PA 15237; telephone (412) 367-3012.

MRS

1986 Von Hippel Award Nominations Sought

The Society's Most Prestigious Honor

The Awards Committee of MRS, chaired by Past President Elton Kaufmann, has announced that nominations are being accepted for the Society's highest award, the Von Hippel Award of the Materials Research Society. The Award is an international hallmark of excellence in the field of materials research, numbering nine prominent materials scientists as past recipients.

The Award is named for the Emeritus Professor of the Massachusetts Institute of Technology, Arthur von Hippel, whose laboratory pioneered the collaborative, interdisciplinary research that subsequently has taken the identity of "materials science." It recognizes those qualities most prized by materials scientists—brilliance and originality of intellect, combined with vision that

transcends conventional scientific disciplines. The Award is presented annually by the Society at its Fall Meeting.

Past recipients of the Award are:

Prof. Arthur von Hippel
Dr. William O. Baker
Prof. David Turnbull
Prof. W. Conyers Herring
Prof. James W. Mayer
Prof. Clarence M. Zener
Prof. Sir Peter B. Hirsch
Dr. Walter L. Brown
Dr. John W. Cahn

The recipient is selected by majority vote of the MRS Council from a slate of candidates that is prepared by the Awards Committee. Nominations should be made

to the MRS Awards Committee. Names put into nomination are, in accordance with MRS By-Laws, considered active for three years. Nominations must be made using the Von Hippel Award Nomination Form and should be accompanied by supporting documentation. Initial screening of candidates will be based upon the information contained on the summary form.

Nominations should be sent to: Elton N. Kaufmann, Lawrence Livermore National Laboratory, P.O. Box 808, L-370, Livermore, CA 94550.

NOMINATION DEADLINE: July 1, 1986.

Additional copies of the **Von Hippel Award Nomination Form** may be obtained from MRS Headquarters.

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Nomination for the VON HIPPEL AWARD of the Materials Research Society

Summary Form

This form is to be used to cover all documentation submitted in support of nominations for the **VON HIPPEL AWARD** of the Materials Research Society. Additional copies may be obtained from MRS Headquarters, 9800 McKnight Road, Suite 327, Pittsburgh, PA 15237; telephone (412) 367-3003.

Full Name of Candidate:

Position and Affiliation (present and recent past):

Address and Telephone:

Education:

Professional Achievements (papers; patents):

Previous Recognition (significant honors and awards only):

Nominator's Statement: The space provided below is to be used for the nominator's summary of the candidate's suitability for the **VON HIPPEL AWARD** of the Materials Research Society. The following topics should be addressed in separate paragraphs:

- (1) interdisciplinary character of candidate's work.
- (2) manner in which candidate's work spans basic and applied science.
- (3) impact of candidate's work outside immediate professional field.

Whenever possible, the nominator's statement should refer to evidence rather than opinion or intuition (if more space is required, attach additional sheets).

List of supporting documents: Supporting documents may include publication, patent, and award listings. At the very least, a listing of the more significant papers published by the nominee should be included. Summary statements of support from additional co-nominators are explicitly encouraged (if more space is required, attach additional sheets).

Return completed form to: E. N. Kaufmann, Lawrence Livermore National Laboratory, P.O. Box 808, L-370, Livermore, CA 94550. Deadline July 1, 1986.

Nominations for the Von Hippel Award of the Materials Research Society

I. Qualification of Nominees

Potential nominees for the Materials Research Society's Von Hippel Award must have outstanding scientific credentials, their scientific work must have had a real impact on materials research, and they must have demonstrated an interdisciplinary approach to materials research. The scientific background of the nominee is of no consideration except that the work must have been in an area(s) commonly associated with materials research. The nominee does not have to be a member of the Materials Research Society and nominees of any nationality are eligible. It is not necessary for the nominee to have won awards from other societies or technical groups. One of our objectives is to identify those individuals who have reached the stage in their career when they will be first considered for major awards.

II. Preparation of Nomination Package

Please follow the outline given on the nomination form and use additional sheets as necessary. It is not essential to provide a complete list of the publications and patents. However, you should provide at least an approximate number for each, and you **must** supply a list of the most important papers and/or books published by the nominee. The three items listed under the nominator's statement are critical items which you must explicitly address. You should attach a letter of nomination for the candidate and you should encourage two or three other distinguished scientists to send supporting letters of nomination. A nomination for the Von Hippel Award remains under consideration for three years, so individuals that you nominate now will remain under consideration through 1988. In preparing the nomination, please bear in mind that the individuals you suggest for this award should have made outstanding contributions to our profession; the nomination package should truly reflect the accomplishments and the stature of the individual—a poorly prepared nomination for an outstanding individual is a disservice to that person.

III. Deadline for Submission of Nominations

To be considered for the 1986 Award, the nomination must be submitted to E. N. Kaufmann, Chairman of the Awards Committee, by **July 1, 1986**. The address is given at the bottom of the front side of this form.

IV. Selection of Von Hippel Award Recipient

The recipient of the Von Hippel Award is determined by a vote of the MRS Council.