POWER-LF/MF: RAS – The Redundant Anode Sputtering Solution

Figure 2:
The redundant anode sputtering (RAS) Split Inductor

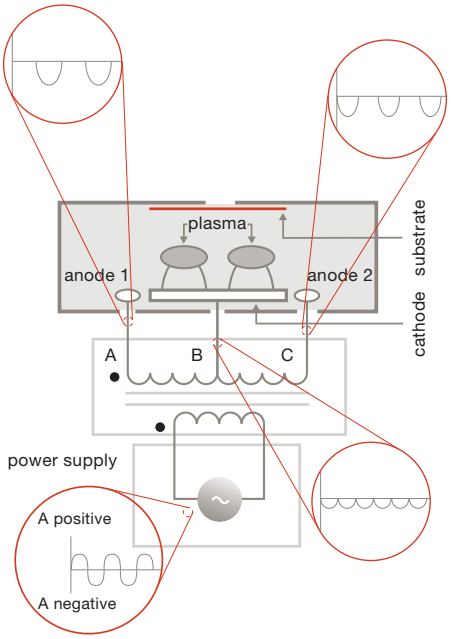

Figure 1:
Schematic of a dual-anode sputtering system

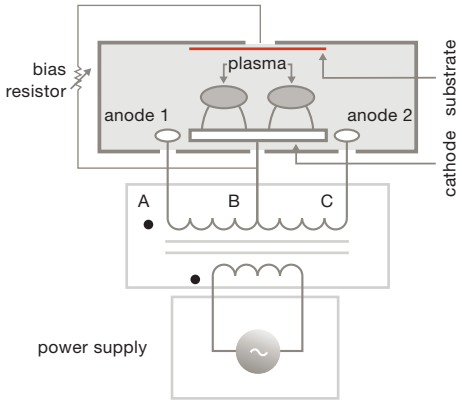

Figure 3:
Schematic of dual-anode sputtering system with substrate connection to the cathode

AC dual-magnetron sputtering (DMS) has been a well known technique for more than 15 years. The need for long-term, stable deposition of insulating materials motivated the introduction of this technology into the industry. Even for the deposition of highly insulating materials like SiO2 or Al2O3, this technique can achieve high deposition rates, good process stability, and high uniformity.

But despite all these benefits, the AC dual-magnetron sputtering process has its limits. A dual-magnetron system has the disadvantage of requiring two targets, which adds expense and complicates maintenance. Furthermore, lack of space for the second target makes retrofitting into existing sputtering systems difficult, if not impossible.

DMS processes also suffer from plasma density decay, which causes over-voltage conditions as the plasma is re-established. Such conditions often increase substrate heating and introduce electrical noise into the system. In addition, the magnetic field over the target, when acting as an anode, impedes the flow of electrons. This causes power loss and reduces the deposition rate.

Another problem with DMS processes is the higher temperature load of the substrates compared to DC processes. This becomes significant for temperature-sensitive substrate materials such as web or other flexible films.

So, there is a need for a sputter technology that provides a long–term, stable process with good layer uniformity, high sputter rates (like a DC process without the disappearing anode problem), and less heating of the substrate, even for the deposition of highly insulating materials.

The redundant anode sputtering solution In the RAS configuration (Figure 1), each anode element acts as a true anode and as a sputtered cathode. Continuous reversal of the voltage and current keeps any insulating regions of the anodes from charging, which inhibits anode arcing. Furthermore, sputtering occurs on half cycles when the element is negative, which prevents insulating film buildup, thus completely eliminating the disappearing anode problem.

The RAS system advantage The RAS system provides sustainable anodes and periodically discharges both the anode and cathode (target) surfaces. This prevents arcing, while eliminating the voltage spikes associated with a DMS. The RAS system is not only easy to retrofit into existing single-target systems, but it also eliminates the difficulties associated with source matching or the unbalanced source erosion typical of a DMS.

This sputter technology enables a high deposition rate for insulating materials. It virtually eliminates arcing and reduces system space requirements. So, the costs are less compared to a dual-magnetron system.

RAS Split Inductor The RAS Split Inductor (Figure 2) is designed for use with PE or PEII 10 kW (or lower) power supply systems, which are part of the Advanced Energy® PE Series. The RAS Split Inductor provides an output center tap to permit operation of PE series power supplies in a system with dual anodes that is run in accordance with the teachings of U.S. Patent 5,897,753. The RAS Split Inductor can handle the full-rated power output of the associated power supply.

The Bias "Knob" The RAS system connects the substrate to the cathode through a resistor to enable easy substrate biasing (Figure 3). This advanced configuration provides enhanced control of bombardment and heating, giving you an added "knob" to directly affect the thin-film structure.

continued on page 4 »

ADVANCED ENERGY®

(continued from page 3)

Contact Information
For further details please contact your local sales representative (for address details please see page 4) or directly

Dr. Uwe Krause
Sr Field Application Engineer,
Advanced Energy Industries GmbH
Raiffeisenstrasse 32
D-70794 Filderstadt (Bonlanden)
Germany

Phone: +49 (0) 351 87 18-128
Fax: +49 (0) 711 7 77 87-00
Email: Uwe.Krause@aei.com

RAS Split Inductor – Physical Specifications	
Size	207.6 mm (H) x 368.3 mm (W) x 410.2 mm (D); 8.2″ (H) x 14.5″ (W) x 16.2″ (D)
Weight	6.8 kg (15 lb)
Mounting	292 mm x 292 mm (11.5″ x 11.5″) base plate with mounting holes

RAS Split Inductor – Electrical Specifications	
Input	
Power	35 A (AC) max, 1100 VRMS at 10 kW, 1600 VPEAK
Frequenzy	40 to 100 kHz
Output	
Voltage from Each Output to Ground	3300 VRMS max

UPCOMING EVENTS:

03.09.-07.09. 22nd European Photovoltaic Solar Energy Conference and Exhibition
Fiera Milano - Exhibition and Convention Center
Milan, Italy – www.photovoltaic-conference.com
Booth # E18, Hall 16

10.09.-11.09. Workshop Pro Flex Vacuum Roll-to-roll Processing of Flexible Materials
Dresden, Germany – www.fep.fraunhofer.de

Paper: Recent developments in plasma generation for web coating applications
U. Krause, Th. Linz, M. Lutz

19.09.-20.09. DISKCON USA 2007
Santa Clara, CA, USA – www.idema.org
Booth # 219

24.09.-27.09. Solar Power 2007
Long Beach, CA, USA – www.solarpowerconference.com
Booth # 337

03.10.-06.10. VTE 2007 (Vacuum Tech & Coating Expo)
Fiera Milano – Exhibition and Convention Center
Milan, Italy – www.vacuumTech.eu
Booth # C20

09.10.-11.10. Semicon Europa
Neue Messe Stuttgart / New Stuttgart Trade Fair Center, Germany – www.semiconeuropa.org
Booth # 2224, Hall 3

Presentation SEMI Technology Arena: Advanced Process Solutions for plasma-based Photovoltaic Volume Production: Generators and Plasma Sources

15.10.-18.10. V2007 (Vacuum Coating and Plasma Surface Technology)
Ramada Hotel Dresden, Germany – www.v2007.net
Booth # 11, Hall „Philharmonie“

05.12.-07.12. Semicon Japan
Tokyo, Japan – www.semiconjapan.semi.org/
Booth # not available yet

AE® European Direct Offices

Continental Europe
Advanced Energy
Industries GmbH
Raiffeisenstr. 32
70794 Filderstadt, Germany
Phone: +49 711 77927-0
Fax: +49 711 7778700
support-de@aei.com

United Kingdom
Advanced Energy Industries UK Ltd.
Unit 5, Minton Place
Market Court, Victoria Road
Bicester, Oxon OX6 7QB
Phone: +44 1869 320022
Fax: +49 1869 325004
AEUK_sales.info@aei.com

France
Advanced Energy
Industries GmbH
32, Résidence Belledonne
38660 LUMBIN
Phone: +33 4 76134845
Fax: +33 4 76134845
Yves.Hamel@aei.com

Distributors / Representatives

Finland
A-Vacuum Oy
Phone: +358 20 7417070
harri.vahamaki@vacuum.fi

Sweden, Norway, Denmark
Advanced Vacuum AB
Phone: +46 40 534070
peter.christensen@advanced-vacuum.se

Germany (Flow)
Vacom Vakuum Komponenten & Messtechnik GmbH
Phone: +49 3641 4275-0
tanja.braeutigam@vacom.de

Spain
Bonsai Advanced Technologies S.L.
Phone: +34 91 661 7987
carlos.elvira@bonsaitech.com

Portugal
Bonsai Technologies
Phone: +351 214141328
pedro.carvalho@bonsaitech.com

Italy
Plasma Focus s.r.l.
Phone: +39 0382 530984
sales@plasmafocus.it

MCU s.r.l. (Flow)
Phone: +39 039 322351
mcusrl@fastwebnet.it

France (Flow)
Omicron Technologies
Phone: +33 476 992260
arousset@omicron-technologies.com

Russia
TBS Egineering Ltd.
Phone: +7 495 247 0833
morikov@tbs-techn.ru

Turkey
Vaksis Ar-Ge ve Mühendislik Egitim
Phone: +90 (312) 265 0146
baybarso@vaksis.com

www.advanced-energy.com

ADVANCED ENERGY®