Melec Up to Date 2018

MELEC GmbH
THE HIGH PULSE POWER COMPANY

Visit us Booth #50
PSE 2018

Cutting-Edge Technology by MELEC GmbH
HiPIMS Superimpose with DC or Mid.-Frequency

SPIK® 3000A
Superior Plasma Instant Kinetics

DC Pulse Power Controller SPIK3000A
Industrial scale
5kW -90 kW DC AVERAGE POWER

• HiPIMS • Mid.Frequency (MF) • DC

Motivation for HiPIMS acceptance in the industry

Highest depositionrate	HiPIMS in combination with DC or Mid-Frequency
Reducing / preventing of arcing / poisoning	HiPIMS used in pulse package mode
Highest process stability tuning; reproduceable	HiPIMS/MF used in bipolar pulse mode
Low cost retrofit applications, single magnetron	Use of your existing DC power supply combined with HiPIMS

Improvements of coating using HiPIMS
- Higher ion bombardment
- Better coating adhesion
- Harder coating
- Denser films

Superimposed Processes for higher deposition rate
- HiPIMS + DC
- HiPIMS + MF

New Address:
MELEC GmbH
Dr.- Rudolf - Eberle - Str.27
D-76534 Baden - Baden
Germany
www.melec.de

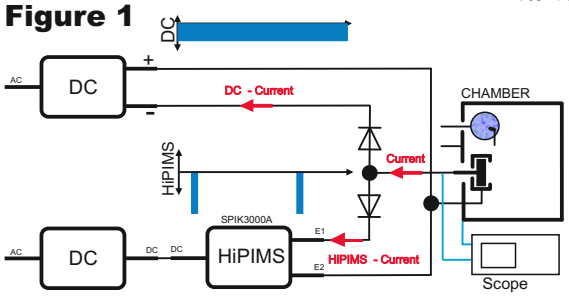
MELEC GmbH licensed SPIK3000A series production at the company SHEN CHANG in Taiwan

伸昌電機股份有限公司
SHEN CHANG ELECTRIC CO. LTD.

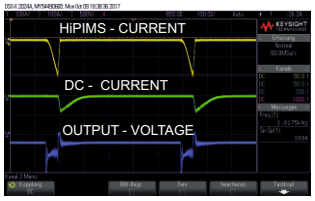
Superimpose HiPIMS applications

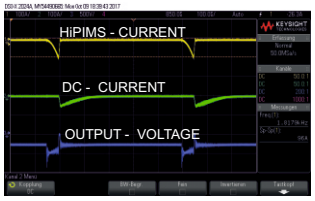
Electric Circuit
Superimposed HiPIMS / DC
using Single Magnetron

Figure 1



HiPIMS:DC
70% :30%





HiPIMS:DC
30% : 70%

Figure 1

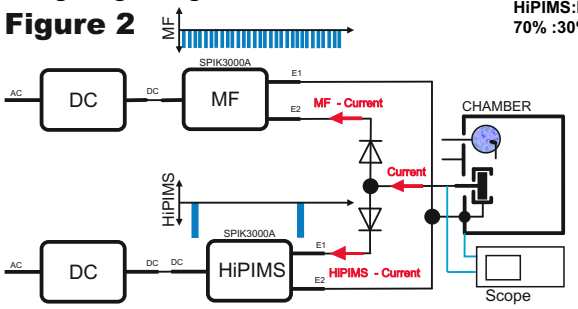
The basic electric circuit shows the different paths of DC-current and HiPIMS-current depending on the different voltage levels (DC = constant; HiPIMS = f(t)). The gate-way of the two diodes is synchronizedautomatically by themselves because of the condition:

DC-V < HiPIMS-V f(t)

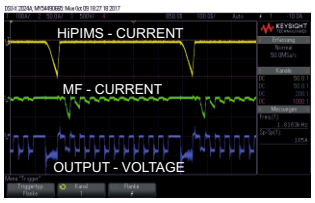
HiPIMS combined with DC generates in the NON REACTIVE SPUTTERING MODE highest depositions rates

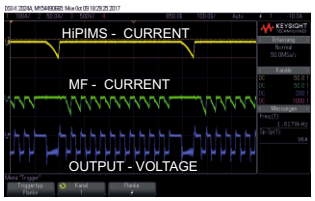
Electric Circuit
Superimposed HiPIMS (UP) / MF
using Single Magnetron

Figure 2



HiPIMS:MF
70% :30%





HiPIMS:MF
30% : 70%

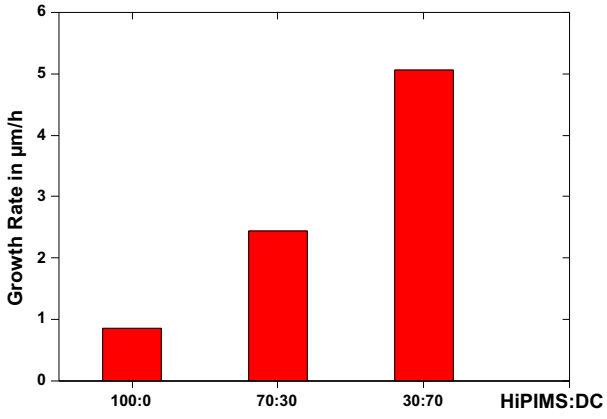
Figure 2

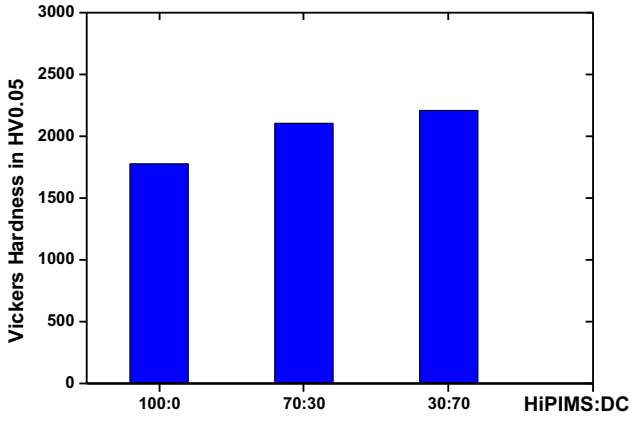
The basic electric circuit shows the different ways of Mid.Freq.-current and HiPIMS-currentdepending on the different voltage levels (Mid.-Freq.-voltage = f(t); HiPIMS-voltage = f(t)). The gate-way of the two diodes is synchronized automatically by themselves because of the condition:

Mid.-Freq.-V f(t) < HiPIMS-V f(t)

HiPIMS combined with Mid.-Freq. generates in the REACTIVE SPUTTERING MODE highest depositions rates, prevents arcing and poisoning.

Ti-N Depositions Rate and Hardness





- HiPIMS+DC total power: 5 kW
- HiPIMS dutycycle 9.1%,Frequency 1818 Hz
- Ti target
- Working Gas: Ar(300 sccm) - N_2(14 sccm)
- without Substrate Rotation

Δ H = +/- (5-10)%

Some projects and collaborations were supported by

Federal Ministry of Economics and Technology
ZIM für wachstum
IAM Institut für Angewandte Materialien
KIT Karlsruhe Institute of Technology

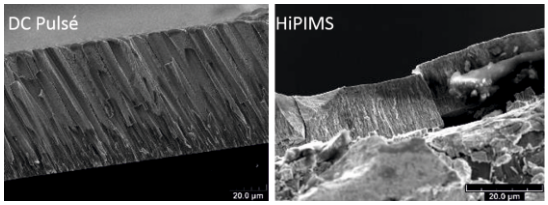
Reference:

Customer Report about HiPIMS application using SPIK3000A

DEPHIS
74 Rue Armand Japy
25460 ETUPES
France
+33 3 81 95 44 01
www.dephis.com
contact@dephis.com

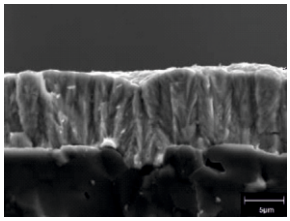
DEPHIS specializes in the production and R&D of innovative thin-film coatings using various Vapor Deposition techniques (Dc-P, Arc, CVD, RF, HiPIMS).
DEPHIS also specializes in the development and fabrication of Vapor Deposition Machines utilizing the DC-P, Arc, CVD, RF, HiPIMS technologies or a hybridization of multiple techniques.

picture 1



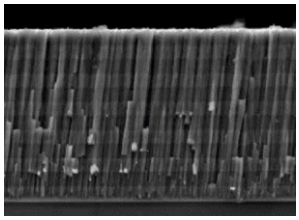
Fractography comparing two coatings made by HiPIMS and DC Pulsé traditional

picture 2



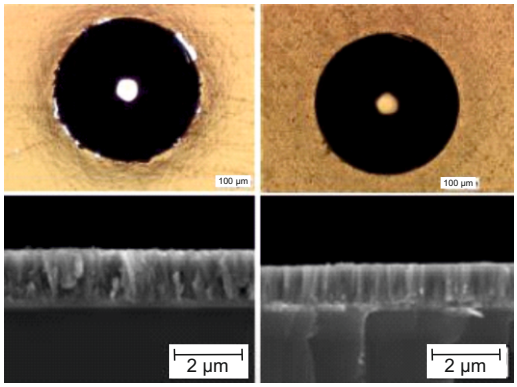
Fractography of a columnar alloy on Alumina substrate

picture 3



Fractography and cross-sectional view of a multilayer metal-ceramic coating for aerospace applications

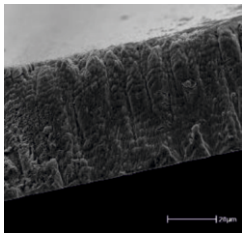
picture 4



Pulsed DC coating HiPIMS coating

Comparison of coatings with different process - HiPIMS VS DC.

picture 5



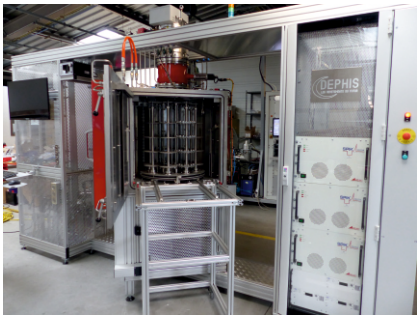
Fractography of an iron alloy (e.g. Fe-Si, Fe-Mg, Fe-C, Fe-Co...) coating on a glass for astrophysic applications.

picture 8

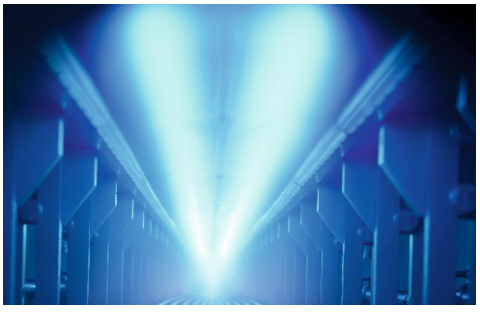
Prototype reactor for the production of large components.This prototype is equipped with the magnetron shown in picture 9

picture 6

picture 7



P9/P10: DEPHIS' latest hybrid coating reactor the TriProS, which combines the HiPIMS, Arc, CVD, DC-P technologies into a single cost effective machine. The machines is equipped with SPIK3000A generators in a bipolar configuration.



picture 9

Example of a 30kW HiPIMS plasma produced by a 5.04m long magnetron fabricated by DEPHIS.

Source: Text and pictures released by DEPHIS

Sales and distribution

USA

Universal Vacuum Technology LLC

Call 510.583.5624

Universal Vacuum Technology, LLC
7172 Regional Street, Suite 230
Dublin, CA 94568
Contact: Les Dahlstedt
510.583.5624
info@universalvacuumtech.com
www.universalvacuumtech.com

China

TRIPLEWINS

Contact person:William Chen
Address: 7th Floor No 14#,Mindong Road 166,
Pudong,201209,Shanghai PRC
Tel:0086-21-61062048
Fax:0086-21-61062028
Mobile:0086-13501897563
Email:sales@www-vacuum.com
Website: www.www-vacuum.com

Taiwan

伸昌電機股份有限公司
SHEN CHANG ELECTRIC CO. LTD.

TEL: +886-2-2621-7650 FAX: +886-2-2623-5967
Address: No.114-1, Siagueirou Shan, Tamsui Dist.,
New Taipei City 25144, Taiwan (R.O.C.)
Email: williamlin@shenchang.com.tw
Contact: William Lin (Extension Number: 73)
www.shenchang.com.tw

South Korea

ABM
Advance Business Material

SheonPark/ ABM Korea
4Dong, 142 Asanvalleyro, Dunpo Myeon,
Asan City, ChoongNam-do, Korea, zip 13409
Tel;+82(0)41-546-8370 Fax;+82(0)41-546-8371
Cell: +82(0)10-5214-5181
sheon@abmkorea.com

India

3S VACTEC

3S VACTEC LLP
21, Vaibhav Jasmine G-1, 13th Main
Saraswathingagar,
Bengaluru - 560 040 - India
Ph : +91 9740 37 3131
www.3svactec.com

JAPAN

ASTECH CORPORATION

Astech Corporation
No. 39-7 Takadanobaba
4-Chrome, Shinjuku-ku
Tokyo 169
Japan
Mr. Mitsuyuki Umino
Tel: 0081 (0)3 33660811
Fax: 0081 (0)3 33655577

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MELEC GmbH
Dr.-Rudolf-Eberle-Str. 27
D-76534 Baden-Baden
Germany
Tel.: +49(0)7223 28145 -01
Fax: +49(0)7223 28145 -09
E-Mail: info@melec.de

Contact:

Günter Mark, CEO
Tel. +49(0)7223 28145 -10
guenter.mark@melec.de

www.melec.de