

# **JVC-7**

## **7th JOINT VACUUM CONFERENCE of Hungary, Austria, Croatia and Slovenia**

May 26–29, 1997

Debrecen, Hungary

## **Final Programme**

**IUVSTA Highlights Seminars  
Scientific Sessions  
Exhibition**

## Sponsored by

IUVSTA, *International Union for Vacuum Science, Technique and Applications*

OMFB, *National Committee for Technological Development, Hungary*

MTA, *Hungarian Academy of Sciences*

OTP, *National Savings and Commercial Bank Ltd.,*

*Hajdú-Bihar County, Hungary*

PFEIFFER Vacuum Austria GmbH, Austria

CABURN-MDC Ltd., UK

LEYBOLD Vakuum GmbH, Germany



## Organized by

Roland Eötvös Physical Society (Hungary)

Hungarian National Committee of IUVSTA

Austrian Vacuum Society

Croatian Vacuum Society

Slovenian Vacuum Society

## Hosted by

Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI)

Debrecen Regional Center of the Hungarian Academy of Sciences (DAB)

Kossuth L. University Debrecen (KLTE)

## Honorary chairman

Dénes Berényi, *President of DAB*

## Scientific Programme Committee

József Gyulai (Budapest) – *chairman*

Sándor Bohátka (Debrecen), Rudolph Dobrozemsky (Seibersdorf),

Branko Gumhalter (Zagreb), Monika Jenko (Ljubljana), György Radnóczy (Budapest),

Herbert Störi (Vienna), Anton Zalar (Ljubljana), Hrvoje Zorc (Zagreb)

## Organising Committee

Sándor Bohátka (Debrecen) – *chairman*

Dezső Beke (Debrecen), Jože Gasperič (Ljubljana), Wolfgang Husinsky (Vienna),

László Kövér (Debrecen), Gábor Langer (Debrecen), Manfred Leisch (Graz),

Imre Mojzes (Budapest), Andrej Pregelj (Ljubljana), Nikola Radić (Zagreb),

Tonica Valla (Zagreb)

## Local Organizers

Sándor Bohátka (*chairman*), István Berecz, István Futó, István Gál, László Kövér,

Gábor Langer, Erzsébet Mikó, Margó Nagy, Vera Szedő

# 7th JOINT VACUUM CONFERENCE

May 26–29

Debrecen, Hungary

## **Aim and Scope of the Conference**

The conference is the 7th in the series of the events which started in 1979, Győr (Hungary). First it was organised by the Austrian and Hungarian societies. The bilateral co-operation has been broadened and now the Joint Vacuum Conferences are organised triennially by Austria, Croatia, Hungary and Slovenia in the years between the European Vacuum Conferences and International Vacuum Congresses. Each of the Joint Conferences has to satisfy the unwritten rules set by the founders of this series keeping high scientific standard and preserving the friendly atmosphere of a small, active community. The organisers of the JVCs have traditionally good contacts with the neighbouring countries and the scientists from the Czech Republic, Poland, Slovak Republic and other countries have always given substantial contribution to the success of our conferences. The colleagues of our region are open to the international scientific community and internationally recognised scientists are regularly invited.

## **Topics of the scientific activity**

Applied Surface Science - ASS  
Electronic Materials - EM  
Nanometer Structures - NS  
Surface Science - SS  
Plasma Science and Technique - PST  
Thin Films - TF  
Vacuum Metallurgy -VM  
Vacuum Science - VS

The topics cover broad ranges of scientific activities in each field, e.g. Vacuum Science involves the production and measurement of vacuum as well as mass spectrometry.

## **IUVSTA Highlights Seminars**

The IUVSTA Executive Council holds its 78th meeting in Debrecen at the weekend preceding the conference. The representatives of the scientific divisions of IUVSTA give an account on the latest developments in their fields. IUVSTA Highlights Seminars are held in a plenary session on the first day of the conference.

Admittance to the IUVSTA HS is free for the participants of IUVSTA ECM-78.

## **Language**

The official language of the conference is English.

## **Location**

*Kossuth L. University*, Debrecen, Egyetem sq. 1 (May 26, Monday, 8.30–13.30)  
*Debrecen Regional Center* of the Hungarian Academy of Sci., (DAB),  
Debrecen, Thomas Mann str. 49

May 26, Monday		May 27, Tuesday		May 28, Wednesday		May 29, Thursday	
8.30	OPENING	PLENARY		PLENARY		PLENARY	
	HIGHLIGHTS SEM.	R. Reid		U. Valbusa		Y. Achiba	
9.00	D.E. Sykes – ASS	TF + EM	VS	SS	TF + VM	ASS + SS	EM
9.30	G.E. McGuire – EM	Pivac	Nemanic	Aumayr	Barna	Pervan	Desnica
10.00	J. Murday – NS	Tvarozek	Setina	Winkler	Mitterer	Sancrofti	Pászi
10.30	G.G. Lister – PST	<i>Break</i>		<i>Break</i>		<i>Break</i>	
11.00	J.H. Weaver – SS	Makaró	Lamprecht	Beutl	Colligon	Biró	Korosak
11.30	<i>Break</i>	Kovács	Hárs	Berkó	Hovorka	Simon	Dávid
12.00	R.P. Howson – TF	Szőrényi	Schwarzinger	Tóth	Radić	Dolezal	Khanh
12.30	A. Korhonen – VM	Evtukh	Drobnic	Gross	Tomov	Heszler	Molnár
13.00	R. Childs – VS	<i>Break</i>		Pogrebnyak	Radi	Sárkány	Pető
13.30	Closing Remarks	<i>Lunch</i>		<i>Lunch</i>		CLOSING	
	<i>Lunch</i>	EXCURSION		NS+ASS+TF	PST	<i>Lunch</i>	
	ASS	to Hortobágy		Langer	-		
15.00	Jablonski			Verhoeven	Musil		
15.30	Brandl	<i>Pusztá Show</i>		<i>Break</i>			
15.50	Kövér	Zalar	Leipner				
16.10	Betz	Menyhárd	Szikora				
16.30	Theuerkauf	Czigány	Mozetic				
16.50	<i>Break</i>	<i>Break</i>					
17.00	POSTER SESSION	POSTER SESSION					
19.00	<i>Concert</i>	ROUND-TABLE DISC.					
20.15	<i>Dinner</i>	<i>Dinner</i>					

Location from May 26, Monday, 14.00: DAB, Debrecen, Thomas Mann str. 49

# Scientific programme

The scientific programme covers plenary and invited lectures as well as oral and poster contributions. IUVSTA Highlights Seminars are part of the scientific programme. Round-table discussion is organized to discuss questions from the participants.

MONDAY,  
May 26

- 8.30 **OPENING** (Kossuth L. University, Aula, 2nd floor)  
*D. Berényi*, Welcome  
*J. Hevessy*, mayor of Debrecen  
*J. Gyulai*, president of the Hungarian National Committee of IUVSTA  
*J. Robins*, president of IUVSTA

## **IUVSTA HIGHLIGHTS SEMINARS** (Kossuth L. University, Aula, 2nd floor)

- 9.00 *D.E. Sykes* (Loughborough, UK) - ASS  
Recent Developments in Surface Chemical Analysis
- 9.30 *G.E. McGuire* (Research Triangle Park, NC, USA) - EM  
Fabrication and Characterization Limits in Advanced CMOS Technology
- 10.00 *J. Murday* (Washington, USA) - NS  
NANO: Science Beginning to Emerge as Technology
- 10.30 *G.G. Lister* (Hayes Middlesex, UK) - PST  
Opportunities and Advances in Plasma Science
- 11.00 *J.H. Weaver* (Minneapolis, MN, USA) - SS  
STM Visualization of Semiconductor Etching
- 11.30 *Break*
- 12.00 *R.P. Howson* (Loughborough, UK) - TF  
The use of plasmas in PVD processes
- 12.30 *A. Korhonen* (Helsinki, Finland) - VM  
Recent Advances in Plasma-Based Hard and Superhard Coatings
- 13.00 *R. Childs* (Cambridge, MA, USA) - VS  
Title unknown
- 13.30 Closing Remarks

*Lunch*

## PARALLEL SESSION – ASS

*The main body of the conference programme takes place in the Headquarters of the Debrecen Regional Center of the Hung. Acad. Sciences (DAB), Debrecen, Thomas Mann str. 49*

### INVITED LECTURE

- 15.00 *Jablonski, A.*  
Monte Carlo simulations of electron transport in quantitative AES and XPS

### ORAL PRESENTATIONS

- 15.30 *Brandl, K.W., Theuerkauf, D., Milanovic, L., Störi, H.*  
Maxmind-management and exchange of method independent data for multi-method surface analysis
- 15.50 *Kövér, L., Kovács, Zs., Weightman, P., Sanjinés, R., Varga, D., Margaritondo, G., Pálinkás, J., Abon, M.*  
Charge transfer in binary Cu-noble metal alloys
- 16.10 *Betz, G., Husinsky, W., Dandachi, C.*  
Cluster emission in sputtering
- 16.30 *Schmölz, P.J.M., Theuerkauf, D., Brandl, K.W., Störi, H.*  
Peak extraction and internal calibration for quantitative Auger electron spectroscopy
- 16.50 *Break*

## PARALLEL SESSION – VM + VS

### INVITED LECTURE

- 15.00 *Presern, V.*  
Advanced vacuum technologies at steel production

### ORAL PRESENTATIONS

- 15.30 *Czél, Gy., Janovszky, D., Kaptay, Gy., Bolyán, L.*  
The effect of nickel on liquid phase sintering of the tungsten–copper system
- 15.50 *Ivan, J., Dubracova, V.*  
Thin wire as a medium vacuum explorer

### 17.00 POSTER SESSION I

- P.1 *Cortona, A., Schmidt, V., Husinsky, W., Betz, G. (ASS)*  
Sputtering of excited Ni atoms
- P.2 *Siber, A., Gumhalter, B. (ASS)*  
Debye-Waller factor in He → Cu(001) collisions: the role of the interaction potentials
- P.3 *Daróczi, Cs., Dóra, Gy., Homonnay, Z., Idzikowski, B., Horváth, Zs. (ASS)*  
STM topological investigations on annealed and boron implanted Fe<sub>80</sub>Mo<sub>7</sub>B<sub>12</sub>Cu<sub>1</sub> amorphous ribbons
- P.4 *Hlavathy, Z., Tétényi, P. (ASS)*  
Effect of hydrogen on the C1-C2 hydrocarbon adlayer on Pt as studied by work function change and Auger electron spectroscopy

- P.5 Tőkési, K., Varga, D., *Kövé, L.* (ASS)  
Surface effects on the inelastic mean free path of electrons in the energy region 20 eV – 5 keV
- P.6 Gervasini, G., Cepek, C., Magnano, E., *Sancrotti, M.*, Bonizzoni, G. (ASS, PST)  
Multi-technique evaluation of Batman and F<sub>82</sub>H martensitic steels for fusion reactors
- P.7 Cepek, C., Magnano, E., Vandre, S., Goldoni, A., Laine, A.D., Curro, G.M., Santaniello, A., *Sancrotti, M.* (NS, SS)  
The electronic structure of the C<sub>60</sub>/Ag(110) and /Ag(001) interfaces explored via ultra-high brightness synchrotron radiation
- P.8 Vandre, S., Goldoni, A., Dhanak, V.R., Santoni, A., *Sancrotti, M.* (SS)  
High-temperature evolution of the Si(111) surface investigated by means of synchrotron radiation
- P.9 *Petrik, P.*, Polgár, O., Lohner, T., Fried, M., Khánh, N.Q., Gyulai, J. (ASS,TF)  
Ion implantation-caused damage depth profiles in single-crystalline silicon studied by spectroscopic ellipsometry and Rutherford Backscattering Spectrometry
- P.10 *Pavlovic, M.*, Desnica, U.V. (EM)  
Improvement in semi-insulating GaAs material quality through a decade – a comparative study of defects with deep levels
- P.11 Riesz, F., Dobos, L., Karányi, J. *Dávid, L.* (EM)  
A combined in-situ scanning electron microscopic and mass spectrometric study of the thermal decomposition of InP
- P.12 Kovács, B., *Dobos, L.*, Mojzes, I., Schusztter, M., Dávid, L. (EM)  
Pattern formation on the surface of heat treated metallizations of compound semiconductors
- P.13 *Manuaba, A.*, Pászti, F., Ortega, C., Grosman, A., Battistig, G. (EM)  
Grazing irradiation of porous silicon by 500 keV He ions
- P.14 *Somogyi, K.*, Mimila-Arroyo, J. (EM)  
Aqueous sulphur passivation effect on the GaAs based photosensitive elements
- P.15 *Somogyi, K.*, Sáfrán, G. (EM)  
On the mechanism of the electric conductivity of vacuum deposited Ag<sub>2</sub>Se thin layers
- P.16 *Somogyi, K.*, Theys, B., Rommeluere, J- F., Varga, Sz., Sveshnikov, A.V., Chevallier, J. (EM)  
Effect of the hydrogen plasma treatment in germanium doped n-GaAs
- P.17 *Pászti, Z.*, Pető, G., Horváth, Z.E., Karacs, A., Guzzi, L. (NS)  
Electronic structure of Ag nanoparticles deposited on Si(100)
- P.18 Imre, A., *Fedor, V.*, Kiss-Varga, M., Mishak, A., Shipljak, M. (NS)  
Photostructural transformations in amorphous chalcogenide nanolayered films produced by thermal vapour deposition
- P.19 *Beer, T.*, Laimer, J., Störi, H. (PST)  
Study of the development of a pulsed DC glow-discharge used for plasma- CVD with an ultrafast videosystem
- P.20 Legrand, J.-C., Diamy, A.-M., *Hrach, R.*, Hrachová, V. (PST)  
A study of reaction mechanisms of methane decomposition in nitrogen afterglow plasma
- P.21 *Hrach, R.*, Horváth, M., Entlicher, M. (PST)  
The Monte Carlo simulation of processes in positive column of DC glow discharge in Ar with increased efficiency
- P.22 *Veibel, E.*, Takács, E., Vámosi, J., Biri, S., Suta, T., Koncz, Cs., Raics, P. (PST)  
Plasma diagnostics measurements on the new ECR heavy ion source of ATOMKI
- P.23 *Posadowski, W.M.*, Brudnik, A. (PST)  
Reactive magnetron sputtering of TiN<sub>x</sub> using high target power density source

- P.24 *Hascík, S., Mozolová, Z., Lalinsky, T., Kuzmík, J., Burian, E., Pogany, D., Matay, L.* (PST)  
The properties of new GaAs power sensor microsystem (PSM) topology design
- P.25 *Huran, J., Hotovy, I., Hascík, S., Kobzev, A.P.* (PST)  
Structural studies of PECVD SiC thin films modified by pulsed electron and ion beams
- P.26 *Hascík, S., Hotovy, I.* (PST, TF)  
Reactive magnetron deposition of NiO thin films with flow modulation of oxygen
- P.27 *Hotovy, I., Huran, J., Hascík, S., Lalinsky, T.* (PST, TF)  
Reactively sputtered NbN Schottky contacts on GaAs and their thermal stability
- P.28 *Laimer, J., Pauser, H., Schwaerzler, C.G., Störi, H.* (PST, TF)  
On the diamond deposition in a supersonic DC plasmajet at pressures in the mbar range
- P.29 *Pözl, H., Strohmeier, G., Eibl, C., Winkler, A.* (SS)  
Quantitative determination of the sticking coefficient of atomic hydrogen on metal surfaces
- P.30 *Eisenmenger-Sittner, C., Bangert, H., Bergauer, A., Seydewitz, F.* (TF)  
Percolation phenomena in sputter deposited aluminium tin films
- P.31 *Zorc, H., Janicki, V., Persin, A.* (TF)  
A quest for convenient procedures in designing of narrow band reflector coatings
- P.32 *Cibulka, V., Vlcek, J., Benda, M., Cerstvy, R., Kubásek, M., Musil, J.* (TF)  
Characterization of surface layers by glow discharge optical emission spectroscopy
- P.33 *Xia, C., Harju, E., Korhonen, A.S., Adamik, M., Lábár, J.L., Barna, P.B.* (TF)  
Structure investigations of wear inhibiting layers on PVD TiN protective coatings
- P.34 *Nemcsics, Á.* (TF)  
Morphological investigation on electrochemical etched GaAs surface
- P.35 *Rau, S.* (TF)  
HTcS thin films excimer laser ablated in reactive vacuum on LaAlO<sub>3</sub>
- P.36 *Senderak, R., Jergel, M., Luby, S., Majkova, E., Spasova, M., Brunel, M., D'Anna, E., Luches, A., Martino, M.* (TF)  
Study of granular Ag-Co films irradiated by excimer laser
- P.37 *Mandrino, D., Marinkovic, V., Prodan, A.* (TF)  
Au growth on (0001) faces of SnS<sub>2</sub> and SnSe<sub>2</sub>
- P.38 *Radic, N., Ivkov, J., Tonejc, A., Car, T.* (VM)  
Thermal stability of amorphous Al-W alloys
- P.39 *Drab, M., Novak, J., Pregelj, A.* (VM)  
Welds on stainless steel realized by nitrogen protecting
- P.40 *Godec, M., Jenko, M., Mast, R., Grabke, H.J., Viefhaus, H., Vodopivec, F.* (VM)  
Sn influence on the recrystallization of non-oriented electrical steel
- P.41 *Godec, M., Jenko, M., Mast, R., Grabke, H.J., Viefhaus, H., Kosec, L.* (VM)  
Tin segregation and the influence on the recrystallization of FeSi alloy
- P.42 *Jenko, M., Godec, M., Vodopivec, F., Mast, R., Grabke, H.J.* (VM)  
Surface and grain boundary segregation of Sb and Sn - effects on silicon steel properties
- P.43 *Steiner Petrovic, D., Jenko, M., Grabke, H.J.* (VM)  
Oxidation of vacuum melted non-oriented electrical steel during decarburization annealing
- P.44 *Vértes, M.* (VS)  
Cleaning of parts for UHV physical equipments
- P.45 *Niewinski, M., Szwemin, P.J.* (VS)  
New version of the C CVS program for calculation a conductance of composite vacuum systems – using Monte-Carlo

- P.46 Szwemin, P.J., *Szymanski, K.* (VS)  
Distribution of the gas density and gas flux in calibration chambers
- P.47 *Siricova, A.* (VS)  
Measuring of very small gas flow under condition of molecular flow
- P.48 *Drab, M., Novak, J., Pregelj, A., Gasperic, J., Tavzelj, M.* (VS)  
Optimization of small stainless steel diffusion pump
- P.49 *Gasperic, J.* (VS)  
The correct operation of high vacuum pumping systems
- P.50 *Novak, J., Pregelj, A., Drab, M., Tavzelj, M.* (VS)  
Development of low-cost vacuum switch
- P.51 *Zgajnar, I., Drab, M., Pregelj, A., Juzina, L.* (VS)  
Vacuum switch with miniature Si diaphragm
- P.52 *Morvay, L., Kubík, I.* (VS, PST)  
Investigation of the equilibrium conditions in vacuum discharge plasmas
- 19.00 *Concert* Nagyerdei Church, Debrecen, Bolyai str. 25
- 20.15 *Dinner* Hotel Postás, Debrecen, Nagyerdei krt. 66

**TUESDAY,**  
**May 27**

**PLENARY LECTURE**

- 9.00 *R. Reid* (Daresbury, UK):  
Quality issues in vacuum

**PARALLEL SESSION – TF + EM**

**INVITED LECTURES**

- 9.50 *Pivac, B.*  
Structure and defects in thin silicon oxynitride films
- 10.20 *Tvarozek, V.*  
Thin films in biosensors
- 10.50 *Break*

**ORAL PRESENTATIONS**

- 11.10 *Makaró, Zs., Dücső Cs., Battistig, G., Horváth, Zs., Likonen, J., Bársony, I.*  
Backside aluminization effects on solar cell performance
- 11.30 *Kovács, I., Tisserand, S., Flory, F., Lábár, J.L., Sulyok, A., Adamik, M.*  
Structure analysis of Ti implanter SiO<sub>2</sub> and Ta<sub>2</sub>O<sub>5</sub> optical coatings
- 11.50 *Szörényi, T., Geretovszky, Zs., Tóth, J., Simon, A., Kiss, Á.Z., Cserháti, Cs.*  
Laser direct writing of tin oxide patterns
- 12.10 *Evtukh, A.A., Kaganovich, E.B., Litovchenko, V.G., Marchenko, R.U., Svechnikov, S.V., Manoilov, E.G.*  
Laser modification of silicon surface for field emission structures

## PARALLEL SESSION – VS

### INVITED LECTURES

- 9.50 *Nemanic, V.*  
Outgassing of H<sub>2</sub> from thin wall stainless steel chamber
- 10.20 *Setina, J.*  
Organization of vacuum metrology in Slovenia
- 10.50 *Break*

### ORAL PRESENTATIONS

- 11.10 *Lamprecht, R.*  
The philosophy of “dry” and “really dry” high vacuum pumping systems
- 11.30 *Hárs, Gy., Tass, Z.*  
Application of quadrupole ion trap for the accurate mass determination of submicron size charged particles
- 11.50 *Schwarzinger, G.W., Dobrozemsky, R., Poschenrieder, W., Langer, U.*  
Vector mass spectrometry at ASDEX Upgrade: recent developments and current status
- 12.10 *Drobnic, M., Mozetic, M., Gams, M.*  
Use of artificial intelligence techniques for catalytic probe modelling
- 13.00 *Lunch*
- 14.00 *Excursion to Hortobágy and Conference Banquet*

WEDNESDAY,  
May 28

### PLENARY LECTURE

- 9.00 *U. Valbusa (Genoa, It):*  
Adsorption, desorption and dissociation: the case of O<sub>2</sub> on Ag

## PARALLEL SESSION – SS

### INVITED LECTURES

- 9.50 *Aumayr, F.*  
Impact of highly charged ions on surfaces
- 10.20 *Winkler, A.*  
Laser spectroscopy on surface reaction products
- 10.50 *Break*

## ORAL PRESENTATIONS

- 11.10 *Beutl, M., Rendulic, K.D.*  
The role of rotational energy in precursor adsorption
- 11.30 *Berkó, A., Ulrych, I., Prince, K., Solymosi, F.*  
Encapsulation of Rh-nanoparticles supported on TiO<sub>2</sub>(110)-(1X1) surface: XPS and STM studies
- 11.50 *Tóth, J., Varga, D., Kövér, L., Gruzza, B., Zeze, D., Jardin, C., Gergely, G.*  
Resolution correction in EELS
- 12.10 *Gross, H., Anbauer, A., Boh, J., Eilmsteiner, G., Winkler, A.*  
Kinetics and dynamics of the Eley-Rideal reaction of hydrogen on aluminum(100)
- 12.30 *Pogrebnjak, A.D., Lavrentiev, V.I.*  
Simultaneous deposition of coverings and high-dose ion implantation on metal surface

## PARALLEL SESSION – TF + VM

### INVITED LECTURES

- 9.50 *Barna, P.B., Adamik, M.*  
Modification of polycrystalline film structures by additives
- 10.20 *Mitterer, C., Losbichler, P., Gibson, P.N., Gissler, W. Hofer, F., Warbichler, F.*  
Nanocrystalline hard coatings within the quasi-binary system TiN-TiB<sub>2</sub>
- 10.50 *Break*

### ORAL PRESENTATIONS

- 11.10 *Colligon, J.S., Valizadeh, R., Bachurin, V. S.*  
Recent developments in hard coatings produced by ion-assisted deposition
- 11.30 *Hovorka, D., Misina, M., Bell, A.J., Studnicka, V., Musil, J.*  
Magnetron sputtered nanocrystalline titanium carbide films
- 11.50 *Radić, N., Tonejc, N.*  
Disordered tungsten-carbon alloys produced by reactive magnetron sputtering
- 12.10 *Tomov, I., Adamik, M., Barna, P.B.*  
Texture characterization of Al/Ti stratified thin films by X-ray diffraction
- 12.30 *Radi, Zs., Barna, P.B.*  
The influence of diffusion mechanisms on phase formation in Al-Pt thin film system
- 13.00 *Lunch*

## PARALLEL SESSION – NS + ASS + TF (multilayers)

### INVITED LECTURES

- 14.30 *Beke, D., Langer, G.A., Kis-Varga, M., Dudás, A., Nemes, P., Daróczi, L., Kerekes, Gy., Erdélyi, Z.*  
Thermal stability of amorphous and crystalline multilayers produced by magnetron sputtering

15.00 *Verhoeven, J., Cilia, M.*  
The application of energetic ions to modify short period (nm range) multilayer systems

15.30 *Break*

### **ORAL PRESENTATIONS**

16.00 *Zalar, A., Jagielski, J., Mozetic, M., Pracek, B., Panjan, P.*  
Characterization of NiAl layers formed with 350 keV Ar<sup>+</sup> ion mixing of Ni/Al multilayer structures

16.20 *Sulyok, A., Menyhard, M.*  
Auger depth profiling at elevated temperature

16.40 *Czigány, Zs., Sjöström, H., Hultman, L., Radnóczy, G.*  
Structure and hardness of Ag/Cu and Ag/Al polycrystalline multilayers

### **PARALLEL SESSION – PST**

#### **INVITED LECTURES**

14.30 –

15.00 *Musil, J.*  
Low-pressure magnetron sputtering

15.30 *Break*

#### **ORAL PRESENTATIONS**

16.00 *Musil, J., Leipner, I., Vlcek, J.,*  
Round magnetron with grooved target

16.20 *Szikora, B.*  
Background of the titanium nitride deposition

16.40 *Mozetic, M., Drobnic, M., Pregelj, A.*  
Determination of atomic hydrogen density along a continuously pumped glass tube

17.00 *Break*

#### **17.20 POSTER SESSION II**

P.53 *Bene, R., Kiss, G., Perczel, I.V., Meyer, F.A., Réti, F. (ASS)*  
Experiments with an MS-coupled DC sensor-tester

P.54 *Sárkány, J. (ASS)*  
Complex effect of water on the FTIR spectra of zeolite Na/ZSM-5

P.55 *Sárkány, J. (ASS)*  
Partial reduction of over-ionexchanged, calcined CuII/ZSM-5 by carbon monoxide  
– an FTIR study

P.56 *Sárkány, J. (ASS)*  
Effect of water on Cu+/ZSM-5 produced by outgassing of over-ionexchanged  
CuII/ZSM-5 – an FTIR study

- P.57 *Papajová, D., Vesely, M. (ASS)*  
Model of the RHEED intensity oscillations based on the reflectivity of the MBE grown surface
- P.58 *Lohner, T., Petrik, P., Polgár, O., Khánh, N.Q., Fried, M., Gyulai, J. (ASS, TF)*  
Ion implantation induced buried disorder studied by Rutherford backscattering spectrometry and spectroscopic ellipsometry
- P.59 *Lugomer, S., Maksimovic, A. (ASS, SS)*  
Laser generated solitons-on-vortex-filaments on Ta surface
- P.60 *Horváth, Zs.J., Ádám, M., Pintér, I., Cvikl, B., Korosak, D., Mrdjen, T., Tuyen, V.V., Makaró, Zs., Dücső, Cs., Bársony, I. (EM)*  
Anomalous temperature dependence of series resistance in Ag/Si and Al/Si Schottky junctions
- P.61 *Subrahmanyam, A., Balasubramanian, N., Manivannan, P., Horváth, Zs.J., Tuyen, V.V., Riesz, F., Rácz, M. (EM)*  
Electrical characteristics of ITO/InP heterostructures
- P.62 *Hahn, E., Lepsényi, I., Kovács, B., Fülöp, S. (EM)*  
Anisotropic etching of single-crystal silicon and producing field-emitting silicon tips
- P.63 *Pődör, B., Reményi, G., Kovács, Gy., Savel'ev, I.G., Gombos, G., Novikov, S.V. (EM)*  
Quantum transport effect in two-dimensional electron gas in InGaAs/InP heterostructures
- P.64 *Pődör, B., Reményi, G., Kovács, Gy., Savel'ev, I.G., Novikov, S.V. (EM)*  
Activated transport in the magnetic-field induced insulating phase in two-dimensional electron gas in InGaAs/InP heterostructures
- P.65 *Pintér, I., Pászti, F., Manuaba, A. (EM, PST)*  
Direct and remote N<sub>2</sub>-plasma immersion ion implantation
- P.66 *Gracin, D., Dubcek, P. (EM, TF)*  
Microstructural properties of a-Si<sub>1-x</sub>C<sub>x</sub>:H by SAXS and IR spectroscopy
- P.67 *Sáfrán, G., Geszti, O., Radnóczy, G., Malicskó, L. (EM, TF)*  
The role of polymorphic phase transition in the formation of (001) oriented Ag<sub>2</sub>Se films on amorphous and crystalline substrates
- P.68 *Dücső, Cs., Khanh, N.Q., Ádám, M., Lohner, T., Fried, M., Bársony, I. (EM, NS)*  
Chemical vapor deposition of silicon nitride into porous silicon
- P.69 *Koller, L., Vrhovec, S., Pozun, K., Railic, D. (EM, VS)*  
Characterisation of vacuum outgassed plastic materials for miniature relays
- P.70 *Schwaerzler, C.G., Laime, J., Störi, H. (PST)*  
Influence of oxygen addition on plasma for diamond deposition
- P.71 *Vorlaufer, G., Laimer, J., Störi, H. (PST)*  
Determination of plasma temperature by measuring the Doppler broadening of emitted spectral lines
- P.72 *Pavlík, J., Novák, S., Hrach, R., Hedbávny, P., St'ovicek, P., (PST)*  
Technological and measuring system for the study of plasma oxidation of aluminium thin films
- P.73 *Mozetic, T. (PST)*  
Plasma ashing of biological samples
- P.74 *Denbnovetsky, S.V., Melnik, V.I., Melnik, I.V. (PST)*  
Application of high-voltage glow discharge electron guns with anode plasma in electron-beam technology
- P.75 *Kántor, Z., Szörényi, T. (PST, TF)*  
Numerical calculation of pulsed laser deposited film profiles
- P.76 *Mozetic, M., Zalar, A., Bogataj, T., Arcon, I., Preseren, R. (PST, TF)*  
Comparison of AES and EXAFS analysis of a thin Cu<sub>x</sub>Al<sub>y</sub> layer on Al substrate

- P.77 *Riedel, M., Düsterhöft, H. (SS)*  
Secondary H<sup>+</sup> ion emission and hydrogen outgassing of metals studied by SIMS
- P.78 *Varga, G. (SS)*  
Calculation of diffraction peak intensities of thermal energy atomic scattering from solid surfaces by time dependent Schrödinger equation
- P.79 *Varga, G. (SS)*  
Determination of Debye-Waller factors from elastic diffraction peaks of thermal energy atomic scattering from solid surfaces
- P.80 *Varga, G. (SS)*  
Determination of intensity distribution of thermal energy atom scattering from disordered solid surface by time dependent Schrödinger equation
- P.81 *Varga, G. (SS)*  
Analysis of classical chaotic elastic atom–surface scattering by quantum mechanical model
- P.82 *Ivanko, J., Almeida, J., Coluzza, C., Zwick, F., Margaritondo, G. (SS,TF)*  
Schottky barrier height dependence on the silicon intralayer thickness of Au/Si/n-GaAs Schottky contacts
- P.83 *Sklenka, W., Bergauer, A., Bangert, H., Eisenmenger-Sittner, Ch., Bauer, W. (TF)*  
Investigation of resputtering effects in the Al-Zn-system: experiments and Monte-Carlo simulation
- P.84 *Hrach, R., Novotny, D., Novák, S., Pavlík, J. (TF)*  
Analysis of methods for the study of semicontinuous and continuous metal film morphology
- P.85 *Soukup, Z., Rafaja, D., Jezek, V., Musil, J. (TF)*  
Effect of Ti interlayer and bias on structure and properties of TiN films
- P.86 *Pozun, K., Koller, L., Remskar, M., Irmancnik B. (TF)*  
Pt thin film deposition on polymer substrate
- P.87 *Chornous, A., Protsenko, S., Shovkoplyas, O. (TF)*  
The investigation of electrophysical properties of double-layer films Cu/Cr, Ni/Co, Co/Cr and Ni/Ti
- P.88 *Dmitruk, N.L., Borkovskaya, O.Yu., Fursenko, O.V. (TF)*  
Optical and electronic characterization of transition layer in thin film Au-GaAs Schottky barrier
- P.89 *Dmitruk, N.L., Gorea, O.S., Mikhailik, T.A., Romaniuk, V.R., Zabashta, L.A. (TF)*  
Multiple-angle-of-incidence ellipsometry for GaAs/GaAs superlattices
- P.90 *Semikina, T.V., Shmyreva, A.N., Semenovich, V.A. (TF)*  
Heterojunction photodetectors with diamondlike carbon films
- P.91 *Shmyreva, A.N., Dushejko, M.G., Scurtul, K.D., Semikina, T.V. (TF)*  
Polyfunctional properties of the doublecomposition films on the basis of zinc oxide
- P.92 *Savchenko, N., Shchurova, T., Trunov, M., Baran, N., Sharkany, J. (TF)*  
Periodic structures based on topological structural transition
- P.93 *Shmyreva, A.N., Dushejko, M.G., Skurtul, K.D. (TF)*  
Thermoelectrical properties of the cerium dioxide semiconductor films
- P.94 *Radnóczy, G., di Forte-Poisson, M.A., Papaioannou, V., Stoemenos, J., Huhn, G., Tóth, L., Pécz, B. (TF, EM)*  
Morphology of GaN layers grown on sapphire substrate by MOCVD
- P.95 *Erjavec, B. (VS)*  
Accuracy of Penning gauge measurements in UHV
- P.96 *Balogh, K. (VS)*  
On use of SAES ST 707 strips for reduction of background lines in a noble gas mass spectrometer

- P.97 *Dabek, J., Michalak, L., Pelc, A. (VS)*  
The double-focusing sector field mass spectrometer for investigations of gaseous clusters
- P.98 *Markowski, A., Michalak, L., Adamczyk, B. (VS)*  
Generation of ions on the crossing of the electron or the photon beam with an effusion molecular beam
- P.99 *Ristoiu, D., Cosma, C., Voros, A., Ristoiu, T. (VS)*  
Quadrupole mass spectrometer coupled with a membrane inlet system
- P.100 *Orsnes, H., Bohátka, S., Degn, H. (VS)*  
Dissociation of water at hot filament in membrane inlet mass spectrometer
- P.101 *Krc-Turba, J. (VS)*  
Metrological assurance of partial pressure at vacuum range
- P.102 *Pregelj, A., Drab, M., Grasic, I., Mozetic, M., Paulin, A. (VS)*  
Studies for optimization of cold cathode Penning gauge
- P.103 *Pregelj, A., Drab, M., Juzina, L., Paulin, A., Mozetic, M. (VS)*  
Field emission electron source experiments
- P.104 *Lindenmájer, J., Hegman, N., Mészáros, S., Vad, K., Langer, G., Csík, A. (TF)*  
RF susceptibility of YBaCuO sputtered films

#### 19.00 **ROUND-TABLE DISCUSSION**

A round-table discussion will be held on topics, which are most sought for by the participants. Hints and proposals have been collected in the Abstract Forms, however, participants are encouraged to put further suggestions.

20.15 *Dinner*

**THURSDAY,**  
**May 29**

#### **PLENARY LECTURE**

- 9.00 *Y. Achiba (Tokyo, Jp)*  
Fullerene cage formation and atom encapsulation

#### **PARALLEL SESSION – ASS + SS**

#### **INVITED LECTURES**

- 9.50 *Pervan P., Valla, T., Milun, M.*  
Structural and electronic properties of ultra-thin vanadium films on Cu(100)
- 10.20 *Vandre, S., Magnano, E., Günther, S., Kolmakov, A., Kovac, J., Marsi, M., Kiskinova, M., Sancrotti, M.*  
The thermally-agglomerated noble-metal/Si(111) interfaces studied by means of synchrotron radiation-based spectromicroscopy
- 10.50 *Break*

## ORAL PRESENTATIONS

- 11.10 *Biró, L.P., Gyulai, J., Havancsák, K.*  
Scanning probe method investigation of nanometer structures produced by irradiation with 200 MeV ions
- 11.30 *Simon, A., Pászti, F., Uzonyi, I., Manuaba, A., Kiss, Á.Z., Dücső, Cs.*  
Effect of surface morphology on scanning RBS microbeam measurements
- 11.50 *Dolezal, M.C., Athenstaedt, W., Leisch, M.*  
Atom probe study of the segregation behaviour of molybdenum-rhenium alloys
- 12.10 *Mechler, Á., Heszler, P., Reimann, C.T., Révész, K., Bor, Z.*  
Cantilever flexure, adhesive/attractive and friction force measurements on highly-oriented pyrolytic graphite by Scanning Force Microscopy
- 12.30 *Sárkány, J.*  
A comparative FTIR study on the effect of counterion on the framework vibrational spectra of zeolite ZSM-5

## PARALLEL SESSION – EM

### INVITED LECTURES

- 9.50 *Desnica, U.V.*  
Wide band-gap II-VI compounds – can the efficient doping be achieved?
- 10.20 *Pászti, Z., Szilágyi, E.*  
Pore structure investigations in porous silicon by ion beam analytical methods
- 10.50 *Break*

### ORAL PRESENTATIONS

- 11.10 *Cvikl, B., Korosak, D., Horvath, Zs.J.*  
Comparative study of I-V characteristics of ICB deposited Ag/p-Si(100) and Ag/n-Si(111) Schottky junctions
- 11.30 *Dávid, L., Kovács, B., Mojzes, I., Pécz, B., Lábár, J., Dobos, L.*  
Structural and electrical characterisation of Ni/Ge-nGaAs interface
- 11.50 *Mohácsy, T., Khánh, N.Q., Ádám, M., Gyulai, J.*  
Modified C-t technique for determining the generation lifetime profile in MeV He<sup>+</sup> implanted silicon
- 12.10 *Molnár, K., Mohácsy, T., Varga, P., Bársony, I.*  
Metallized diffused porous-crystalline silicon LED structures
- 12.30 *Pető, G., Kanski, J., Molnár, G.L., Hua, Q.*  
Angular resolved photoemission studies of HoSi<sub>2</sub> thin film

### 13.00 CLOSING

*Lunch*

## Exhibition

An exhibition takes place during the conference in the Headquarters of the *Debrecen Regional Center* of the Hungarian Academy of Sciences, DAB, (Debrecen, Thomas Mann str. 49).

### Exhibitors

ALCATEL Hochvakuum Technik GmbH, Germany  
CABURN-MDC Ltd., UK  
EDWARDS Hochvakuum GmbH, Germany  
LEYBOLD Vakuum GmbH, Germany  
KONTRADE+ Kft., Hungary  
PFEIFFER Vacuum Austria GmbH, Austria  
VACOM GmbH, Germany  
VARIAN S.P.A., Italy

## Social programmes

All the Participants and Accompanying Persons registered to JVC-7 are welcome to these programmes. Please have your badge on.

### Get-together Party

May 25, Sunday 18.30–20.00

*Venue:* Debrecen Regional Center of the Hung. Acad. of Sci. (DAB), Thomas Mann str. 49

### Concert

May 26, Monday 19.00–20.00

*Venue:* Nagyerdei Church (Bolyai str. 25) just neighbouring the place of the conference, DAB

*Programme:* Choir of the Reformed College Debrecen, conducted by Sándor Berkesi,  
Organ music by Dezső Karasszon

### Excursion to Hortobágy and Conference Banquet

May 27, Tuesday

*Tentative programme*

14.00 Departure from Kossuth L. University (Debrecen, Egyetem sq. 1), by buses

15.00 Visiting local museums (arts, folklor, flora and fauna)

16.00 **Pushta show** couching in the puszta

18.00 Walking in the village Hortobágy

19.00 **Banquet** in *Hortobágy Csárda*

### Sightseeing tours

Other sightseeing tours and excursions are offered by the tourist service on separate sheets and on location of the conference.

## General information

### Venue

The Debrecen Regional Center of the Hungarian Academy of Sciences (DAB, Debrecen, Thomas Mann str. 49) in the northern part of Debrecen will provide the facilities for the Conference and Exhibition. This quiet place ensures optimal conditions for information exchange.

Debrecen is 224 km east of Budapest, in the middle of the Great Hungarian Plain, on the border of Hortobágy, the Magyar Puszta, which is the biggest National Park of Hungary and famous for its special fauna and flora. Debrecen is the second largest city in the country and the economic, educational and artistic centre of Eastern Hungary, with a rich and unique cultural and religious history. It is abundant in thermal water. In the surroundings of Debrecen many precious pieces of the traditional architecture, folk-art and workshops of craftsmanship can be found, and this area is not far from the famous wine cellars of Tokaj and Eger.

### Registration

#### *Registration Desk and Conference Office*

The Registration Desk of JVC-7

May 25, Sunday, 16.00–20.00: Hdq. of Debrecen Reg. Center of Hung. Acad. Sci. (DAB)  
Debrecen, Thomas Mann str. 49

May 26, Monday, 8.00–13.00: Kossuth L. University (KLTE) Debrecen, Egyetem sq. 1  
15.00–19.00: Hdq. of Debrecen Reg. Center of Hung. Acad. Sci. (DAB)

Other days: during scientific activity, in DAB.

<i>Registration fee</i>	<i>before 14 Apr.</i>	<i>after 14 Apr.</i>
participants:	300 DEM	380 DEM
students (document is required):	180 DEM	220 DEM
accompanying persons:	160 DEM	200 DEM

The registration fee includes:

*for active members:* attendance to the Conference and Exhibition, Conference Materials;

*for active members and accompanying persons:* lunch, coffee and refreshments daily; Get-together Party; Conference Excursion and Banquet.

### Oral and poster contributions

#### *Oral*

After plenary lectures (45 min each) and invited lectures (30 min each) oral presentations (20 min each) are organised in parallel sessions.

Overhead projectors and slide projectors (5cm×5cm) will be provided.

#### *Poster*

There are two sections of poster presentations, posters of each topic are evenly arranged in both sections. All posters are displayed for one day and a half to allow detailed discussions. Posters should be fixed on Monday between 8.00–15.00 (Poster session I, P.1–P.52) and on Wednesday between 8.00–11.00 (Poster Session II, P.53–P.104). The posters will be displayed until Tuesday 13.00 and Thursday 13.00, respectively.

Please note that identification numbers differ from the tentative registration numbers.

*Poster area:* width: 120 cm; height: 130 cm.

## Proceedings

The *Proceedings as Selected Papers of the Conference* including the plenary and invited papers and some selected oral/poster contributions will be published in the journal VACUUM. The available space in the special issue of the journal limits the number of selected papers, however it is a good opportunity to publish the papers in the well-known international scientific journal.

The contributions will be evaluated and advised for publication by the Guest Editors of the conference. The publication will be at no cost to the authors but please note that the Organisers do not order copies for the delegates. Obviously, each paper which is not published in the special issue can be submitted to the journal individually on its usual way and then it is reasonable to remark in the footnote that it was a contribution to the JVC-7. Authors submitting their papers to the Conference Office will be informed not long after the conference in order to help possible individual submissions.

*Submission of papers* to the Conference Office: May 26, 1997.

## Extended Abstracts

Authors of all accepted papers were invited to submit camera-ready extended abstracts (max. 2 pages of A4 format) *to the Conference Office to be received until April 30, 1997. Papers received later are not included into the booklet.*

The A4 format is reduced to A5 format and printed by the organisers. The participants will get one copy of the *Extended Abstracts* with the conference materials.

## Transportation

**Travel by plane.** The two airport terminals of *Budapest-Ferihegy* Airport are connected to Budapest downtown by a special airport coach. The city bus terminal is located in Erzsébet Square, and there is a Metro (subway) station nearby (Deák square station) which provides easy access on the *blue line* to *Budapest Nyugati* (Western) and on the *red line* to *Budapest Keleti* (Eastern) and *Budapest Déli* (Southern) Railway Stations. Alternatively, the *Airport Minibus Service* can be used directly between Ferihegy Airport and any destination in Budapest (fare in May, 1997: 1000 Ft/person). Regular bus service: *red* No. 93 to Railway- and Metro Station *Kőbánya-Kispest* to change for fast trains to Debrecen.

**Travel by train.** Trains from Vienna, Bratislava, Prague, Warsaw, Ljubljana, Zagreb and Belgrade arrive at *Budapest Keleti* railway station, trains from Moscow, Kiev and Bucharest arrive at *Budapest Nyugati* station.

*InterCity* trains are recommended to Debrecen. The trip takes 2 hrs 20 mins from *Budapest Nyugati* station. IC-trains depart from Budapest every three hours between 7.05 and 19.05 to Debrecen (from Debrecen to Budapest every three hours between 6.58 and 18.58). For the IC-trains a *seat reservation* is obligatory. *Other trains* are in almost every hours between 06.10 and 21.10 and travel time is about 3–3.3 hrs.

*Direct train* (Arrabona Express) from Vienna to Debrecen: d 16.07 – a 22.40; from Debrecen to Vienna: d 7.14 – a 14.00.

**Travel by car.** From Vienna (via Nickelsdorf (A)/Hegyeshalom (H)): on motorway No. 1 (M1) to Budapest (178 km). Toll: between Hegyeshalom and Győr (ca 2000 Ft), other motorways are toll-free.

*Budapest-Debrecen:*

a) First on motorway M3 (direction: Miskolc): 80 km to Gyöngyös, then on highway No. 3 (direction: Miskolc): 34 km to Füzesabony, and on highway No. 33 (direction: Debrecen): 118 km to Debrecen. Travel time: 2.5–3 hours depending on the traffic.

b) On highway No. 4 (direction: Debrecen): 224 km to Debrecen. Travel time: 2.5–3.5 hours depending on the traffic.

*Speed limits:* motorway: 120 km/h; highway, *other roads:* 80 km/h; *in town:* 50 km/h.

**Local transportation.** Tickets for local public transport have to be purchased in advance at the tobacconist, kiosks, ticket vending machines, etc. Note, that in Debrecen there are *different tickets for tram (50 Ft) and for buses (60 Ft)*. A ticket is valid for one journey and must be validated at the ticket puncher inside the vehicle.

For your orientation in Debrecen, a *schematic map* is enclosed on the back cover.

### Meals

Lunch is provided each day in the dining room of Kossuth L. University (Debrecen, Egyetem sq. 1). Dinner will be served in Hotel Postás (Debrecen, Nagyerdei krt. 66). Meals are offered only for Participants and Accompanying Persons registered for JVC-7. Please, hold your badge on.

### Weather

In May, a mild daytime temperature around 15–20 °C and somewhat cooler temperature at night are expected, with occasional rain or short showers. An umbrella and sweater are advised to have at hand.

### Currencies

Hungarian currency is Forint (Ft, HUF). 1DEM = 102.6 Ft; 1 USD = 176.7 Ft (May 1, 1996).

You are advised to change money at official desks (hotel receptions, banks, tourist offices) only to a suitable amount. In many shops you may use your credit cards.

### Telephone

Public telephones operate either with coins (of 10, 20 HUF) or with cards accessible at hotel receptions, tabacconists, etc..

For an *international call*, please dial 00 first, then after a tone, dial the prefix of the country you are calling, finally the area and local number. Hungary's code number for an *international call from abroad* is 36.

For an *interurban call* within Hungary, please dial 06 first, wait for another tone, then dial the area code number of the city (that is 52 for Debrecen), and accomplish dialing by the customer's local number.

### Important addresses

All correspondence should be done to the *JVC-7 Conference Office*:

*Until May 23*

ATOMKI

Bem sq. 18/C

H-4001 Debrecen, POB 51

Hungary

Phone: (36)-52-417 266

Fax: (36)-52-416 181

E-mail: [jvc-7@atomki.hu](mailto:jvc-7@atomki.hu)

*May 25–29*

Debrecen Regional Center of the Hung. Acad. Sci. (DAB)

Thomas Mann str. 49

H-4032 Debrecen

Hungary

Phone: (36)-52-412 177

Fax: (36)-52-410 909

Web-site: [www.atomki.hu/JVC-7/](http://www.atomki.hu/JVC-7/)

## Hungarian hospitality

### It begins even before you enter the country

It starts when you enter the world of MALÉV, Hungary's national airline. With comfortable, scheduled service to 38 cities in 27 countries, MALÉV can put you in Budapest, the heart of Hungary's business future. And the centre of its romantic past and present.

MALÉV offers more non-stop flights to Budapest than any other carrier. There are even two daily connections to and from Europe's busiest gateways: Berlin, Frankfurt, London, Rome, Zurich, plus one non-stop daily service to New York Kennedy Airport.

For your next business or pleasure trip, be sure to include the land of Bartók and the blue Danube in your itinerary. And be sure to call MALÉV to get you there comfortably.

**Malév Plc Regional Office**  
**4026 Debrecen, Kálvin tér 4/b**  
**Phone: 52-416-545**  
**Fax: 52-414-460**

**MALEV** Hungarian Airlines 



## **WINTECH COMPUTER KFT.**

Selling complete computers and burotechnic devices  
Service of Epson, Canon, HP printers and Sharp copiers  
Computer applications in music, MIDI  
Selling of parts, repair  
Buro and office management softwares, auditation  
Turn-key informatics systems, agency



Debrecen, Domb u. 3

Telephone: (36)-52-423-235

Tel/Fax: (36)-52-417-604

Office hours: Monday–Friday 8.30–16.00

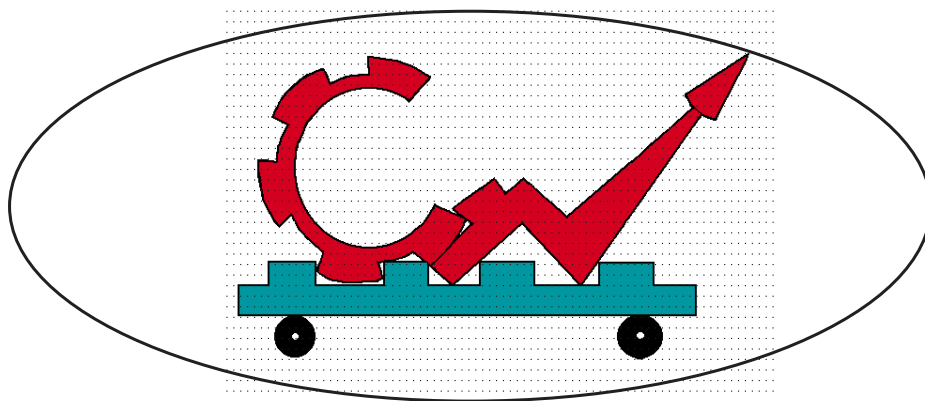
**GOODWILL – TRADE Kft.**

**4220 HAJDÚBÖSZÖRMÉNY, HUNGARY**

**Bíró Péter u. 14**

**Tel/Fax: (36)-52-371-639**

**Mobil: (36)-30-537-399**



**TRADE and SERVICE  
in  
VACUUM ENGINEERING**

We offer you the service, repair and trade of  
**vacuum pumps, equipments and accessories**

manufactured by

**ALCATEL    LEYBOLD**

**BALZERS    EDWARDS**

**TUNGSRAM**

and others



# DEBRECEN

- Hotel
- ST** Student Hostel
- Gy** Nagyerdei Gyógyszálló
- T** Hotel Thermal
- C** Hotel Civis
- F** Hotel Főnix
- S** Hotel Stop
- L** Ludas Matyi Panzió
- P** Péterfia Panzió
- Tourist Office
- Restaurant
- Post Office
- Hospital
- Camping
- Swimming pool
- Tramway
- Bus

