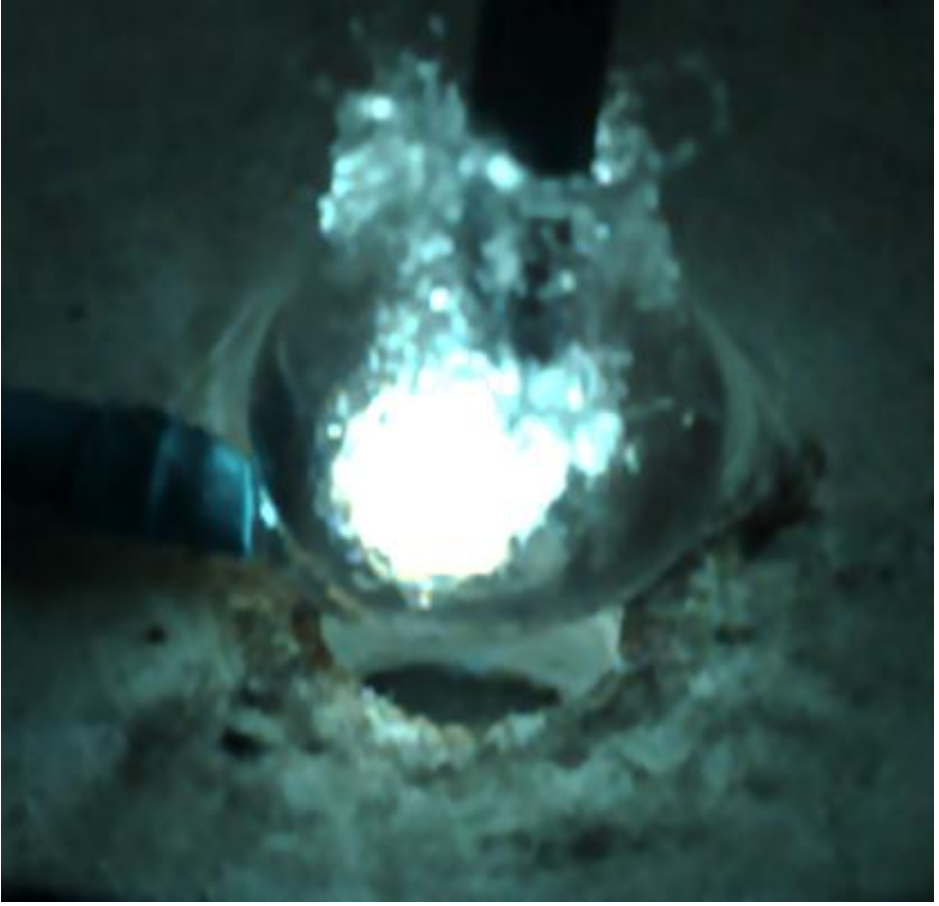


Interaction of Hydrogen Atoms and Ions with Erosive Metal Clusters in Heterogeneous Plasmoid

Klimov A., Belov N., Tolkunov B., Chistolinov A.,
JIHT RAS, Moscow, Russia

12th IWAHLM, Italy, 5-9 June 2017

Content

- Introduction
- Experimental set up
- Experimental results
- Discussion and conclusion

Introduction_1

Two main approaches in LENR physics:

Thermal, equilibrium
Parchomov A., Rossi A., others

Maxwell's distribution tails
Excitation energy < eV
Small efficiency, small COP
COP<3
Simple design but
bad reliability
Safety- high

Non-thermal, (non-equilibrium)
Bazhutov Yu, Klimov A., Mills R., and and others

Hot electrons and ions, UV and X- radiation,
Excitation energy~ 100-1000 eV
High efficiency, high COP
COP ~2-16
Expensive power supply and
heat transformers
Safety-?????

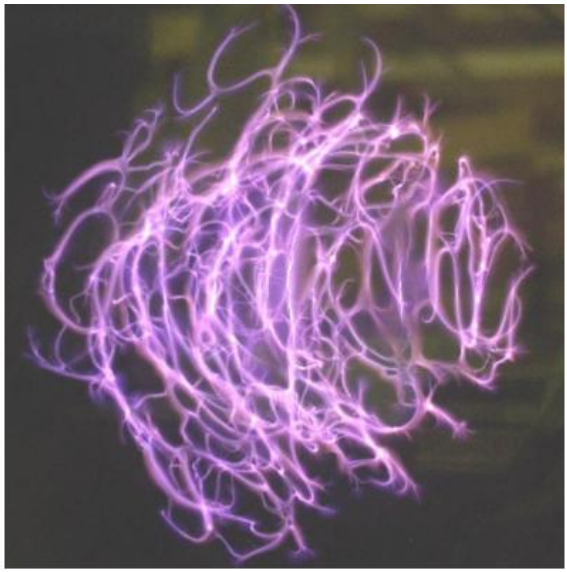
Introduction_2
Non-thermal approach

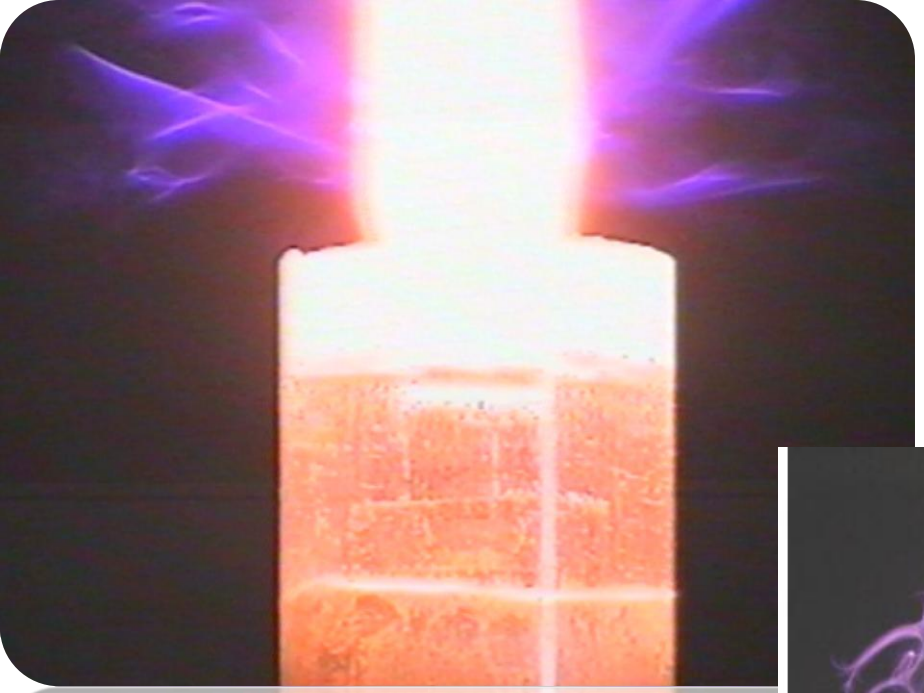
- **Plasmoid????** ⟹

It is a stable, local, non-equilibrium ($T_e >> T_a$), charged (non-neutral), long- living, high-energy plasma formation with

⟹

- Internal constricted (non-diffused) structure
- Sharp boundary surface
- High voltage electric potential φ~(100-1000)V and higher
- High life time T_{life}~ 1-1000ms
- High specific energy q~100eV/atom
- High concentration of charged and exited particles, $N_e > 10^{17} cm^{-3}$





PLASMOIDS

Introduction_3
Non-thermal approach

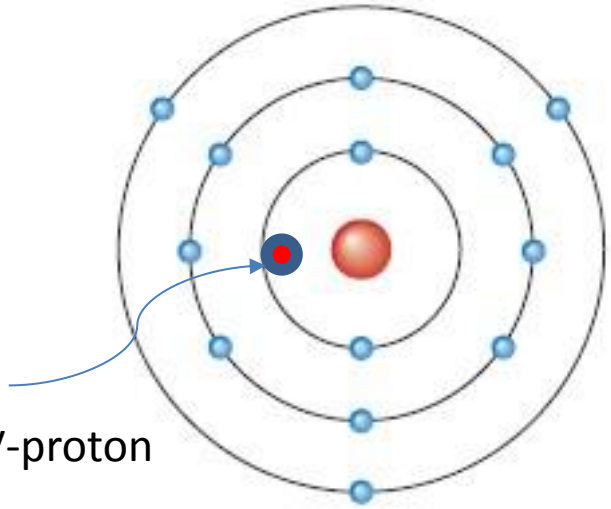
Main important characteristics and peculiarities of *metal nano-cluster – hydrogen plasmoid interaction* :

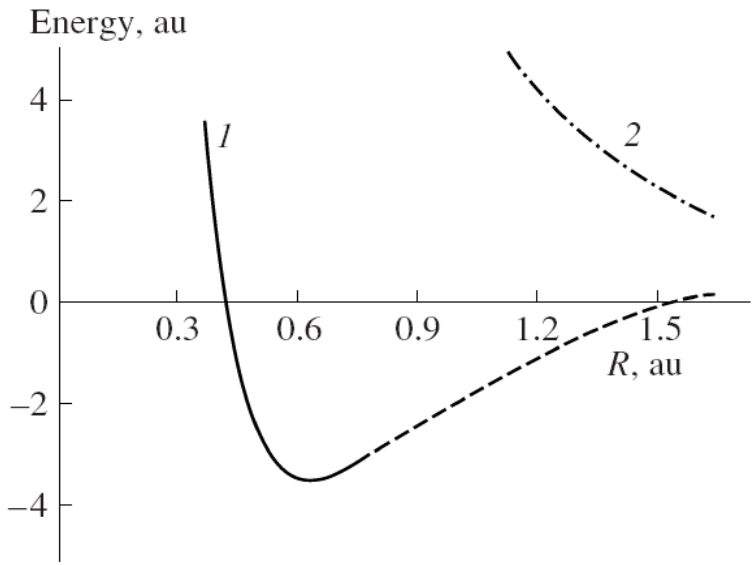
1. Diameter of H^+ ion less than the typical diameter of other A^+ ions by factor ~10^4. *Hydrogen ion has no "electron parachute"!!!!*
2. There is real *interaction H+ (~KeV-energy) with internal electrons* of metal atom.
3. There is possibility to realize of a resonance regime of plasma electron - metal nano-cluster interaction:

$$\lambda_e \sim h/m_e(T_e)^{1/2} \sim D_{cluster}$$

at plasma electron temperature T_e~1eV and $D \sim nR_B$, n~10

$\Longrightarrow$ creation of *strongly electric charged plasmoid* with high voltage





Potential energy of the proton–heavy atom system as a function of distance: curve *1* describes the energy of the proton–heavy atom system ($Z = 80$) as a function of distance R between the proton and the nucleus; curve *2* is potential $\Phi(R)$. The dashed curve shows one of possible versions of a dependence intermediate between *1* and *2*.

Introduction_3. Continuation

H^+ - single **small** ion (dimension $R_p \sim 10^{-13}$ cm)
without large "electron parachute" ($R_B \sim 10^{-8}$cm)
$R_p << R_B$

⟹

***Binuclear Atom as the Bound State of a Proton and a Heavy Atom**

V. P. Chalyi, V. L. Gurevich, and M. Yu. Pogorelsky
Ioffe Institute RAS
Techn.Phys., 2009, Vol. 54, No. 2, pp. 159–164

The existence of a bound state of a proton and a heavy atom is predicted

The distance between the nucleus and the bound proton (≈0.3 Å for $Z \approx 80$) *is much smaller than the* characteristic size of the wave functions of valence electrons. This means that the chemical behavior of such a system after adjoining an extra electron to neutralize it must resemble the behavior of an ***atom with atomic number Z + 1.***

Background Results in Plasmoid Physics

Part 1

“New Prometheus’s fire”. *UV- plasmoid catastrophe*.

1. Artificial stable microwave (MW) plasmoid was obtained and studied by Kapitsa P. in swirl gas flow at the first time [1]. Main result:- Increase of output UV radiation flux from this plasmoid **up to factor 10^6.**

2. Experiment “MW Fire” (1960-1980, USSR) proved this conclusion. There is **UV- catastrophe** in a local stable MW plasmoid.

3. *R.Mills calculates and measures UV and soft X-radiation spectra hydrino from plasmoid.

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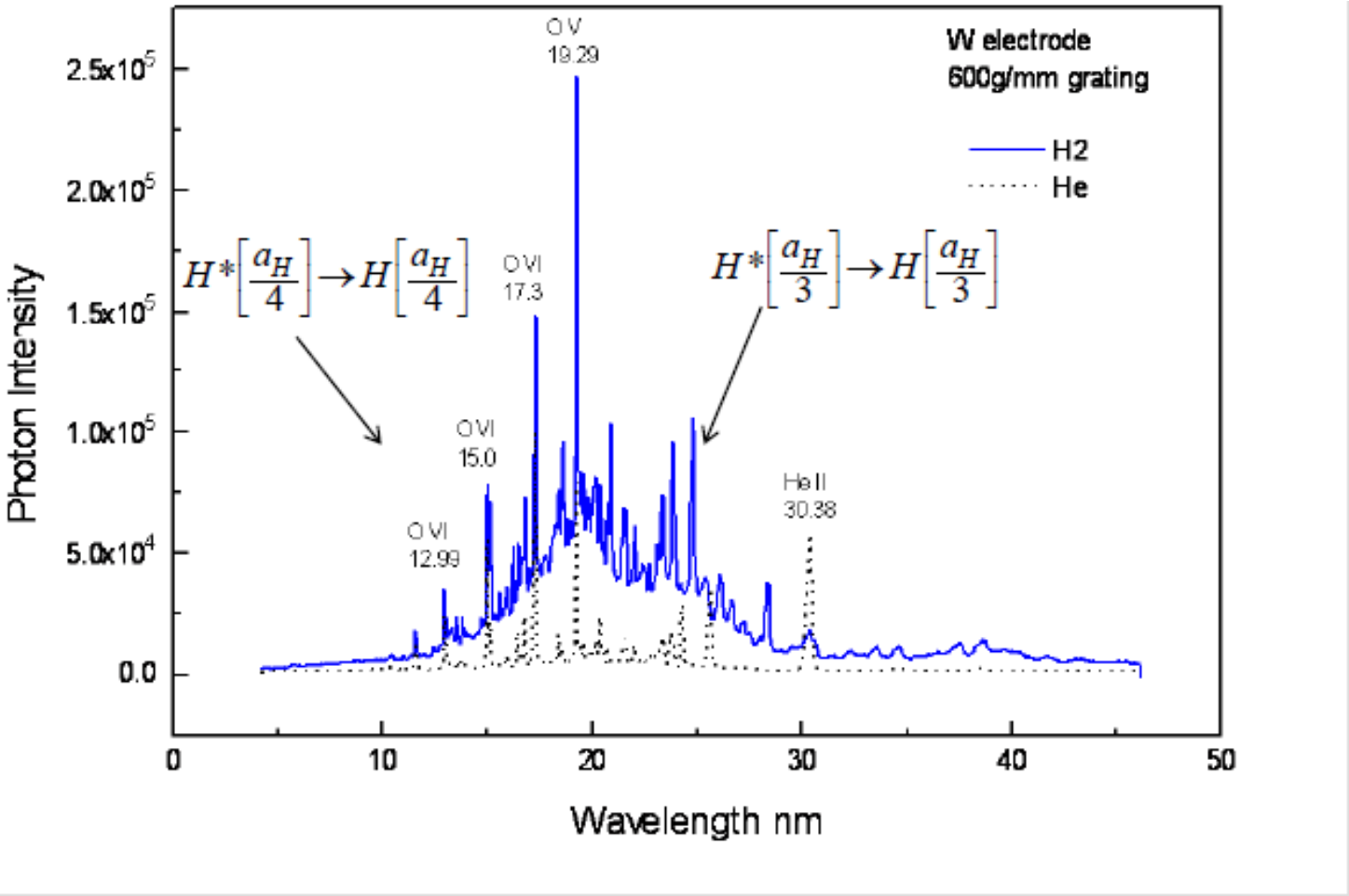
* R. Mills, Summary Tech. Pres. BLP, 08-05-11

“UV- Catastrophe”

* R. Mills, Summary Tech. Pres. BLP, 08-05-11



Emission spectrum (2-45 nm) of an electron-beam-initiated, high-voltage pulsed discharge in hydrogen, recorded by the EUV grazing incidence spectrometer. The predicted continua at 10.1 nm and 22.8 nm going to longer wavelengths were observed.

Background. Part 2

Experimental and theoretical studies on heterogeneous vortex plasmoids are carried out in Limited Liability Company “New Inflow” in the frame of the program on design of ***high effective plasma vortex reactor (PVR)*** with high coefficient of power performance

COP~ 2-10

Physical parameters and properties of a stable heterogeneous plasmoid (plasma formation with erosive nano-clusters) created in high-speed swirl flow have been studied in our works [1-2].


РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2554512

СПОСОБ ПОЛУЧЕНИЯ ТЕПЛОВОЙ И ЭЛЕКТРИЧЕСКОЙ ЭНЕРГИИ И УСТРОЙСТВО ДЛЯ ЕГО РЕАЛИЗАЦИИ

Патентообладатель(ли): *Общество с ограниченной ответственностью "Нью Инфлоу" (RU)*

Автор(ы): *см. на обороте*

Заявка № 2014111562

Приоритет изобретения 27 марта 2014 г.

Зарегистрировано в Государственном реестре изобретений Российской Федерации *29 мая 2015 г.*

Срок действия патента истекает 27 марта 2034 г.

Врио руководителя Федеральной службы по интеллектуальной собственности

Л.Л. Кирий

1. Klimov A., Energy Release and Transmutation of Chemical Elements in Cold Heterogeneous Plasmoid, Proc. ICCF-19, Padua, Italy, 2015
2. Климов А.И., Авдейчик В.Г., Евстигнеев Н.М., и др., Патент РФ 2554512, 2014

Background. Part 2

Physical properties of a longitudinal heterogeneous plasmoid (plasma formation with erosive metal nano-clusters) created by capacity coupled high-frequency (HF) discharge in high-speed swirl flow have been studied in our works in details [2÷6]. This work is continuation of previous ones

It was obtained that there is extra power release in heterogeneous plasmoid created by combined discharge.
The measured value ***COP*** in this plasmoid was about **2÷10**.

We suppose that this extra power release in heterogeneous plasmoid is connected with *high-threshold chemical reaction with internal electron excitation* by combined discharge and *LENR*.
The obtained experimental results (COP, optical spectra, soft X-ray spectra, chemical composition of dusty particles) prove our suggestion.

References

[1] P. Kapitsa, Free Plasma Filament in MW Field at High Pressure, Zhur, Exp. Teor. Fiz. 57(6):1806-1866

[2] A. Klimov, Vortex Plasmoids Created by High_Frequency Discharges, Atmosphere and Ionosphere: Dynamics, Processes, Monitoring (Springer, Berlin, 2013)

[3] Klimov A., Bityurin V., et.al., Study of a Longitudinal Plasmoid Created by Capacity Coupled HF Discharge in Vortex Airflow, AIAA Paper 2009-1046, 47th AIAA Aerospace Sciences Meeting, 5 - 8 January 2009, Orlando, Florida, 2009, P.12

[4] Molevich N., Porferiev D, et.al. Structures of the single electrode RF gas discharge in swirling air flow, 10th WSMPA, March 22 – 24, 2011, Moscow. C.62-68

[5] Klimov A., Evstigneev N., Moralev I., et.al., Vortex Control by Combined Electric Discharge Plasma, AIAA Paper 2013-1046, 51th AIAA Aerospace Sciences Meeting, Dallas, Texas, 2013, P.15

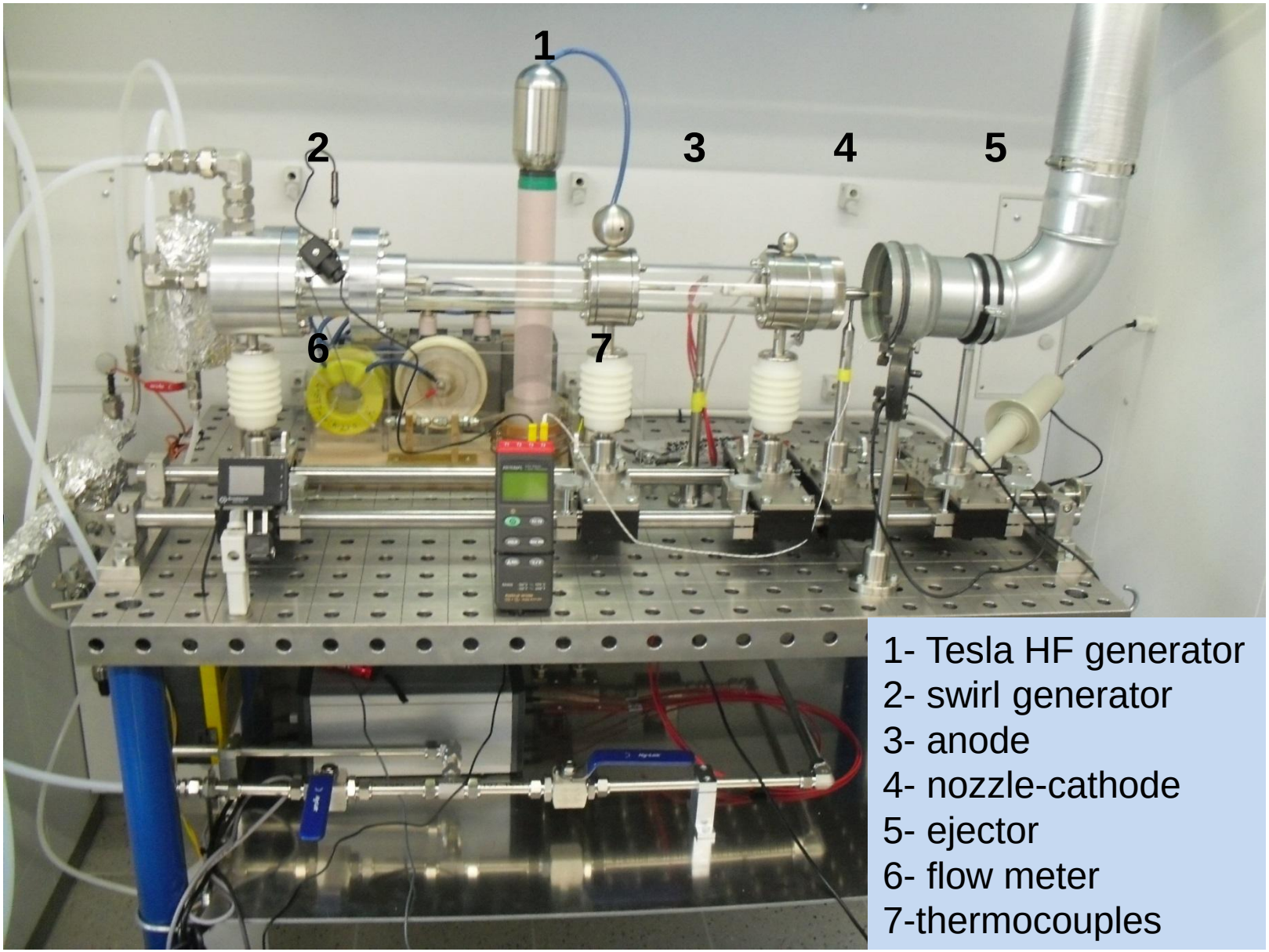
[6] Klimov A., Energy Release and Transmutation of Chemical Elements in Cold Heterogeneous Plasmoid, Proc. ICCF-19, Padua, Italy, 2015

Part 3

EXPERIMENTAL SET UP

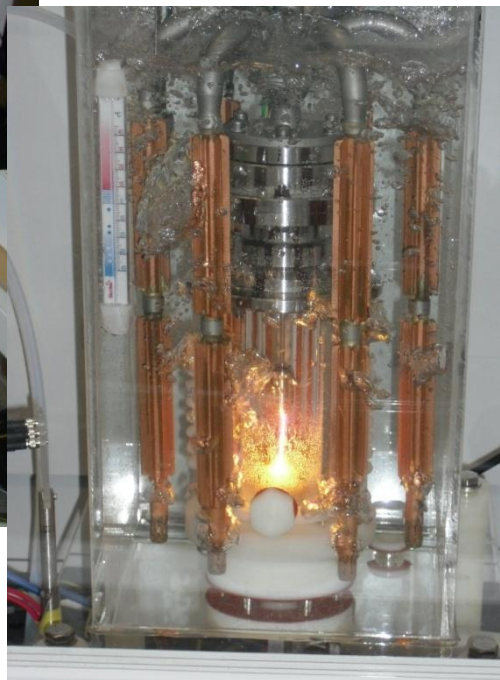
Experimental set up.

Plasmoid Vortex Reactor PVR



1- Tesla HF generator
2- swirl generator
3- anode
4- nozzle-cathode
5- ejector
6- flow meter
7-thermocouples

Set up PVR with Water Pool (Calorimeter)



Experimental Set up **PVR**

Main Tasks of this work are the followings:

1.Design of plasmoid vortex reactor (PVR) with high value of COP

2. Formulation of theoretical physical model of LENR in PVR.

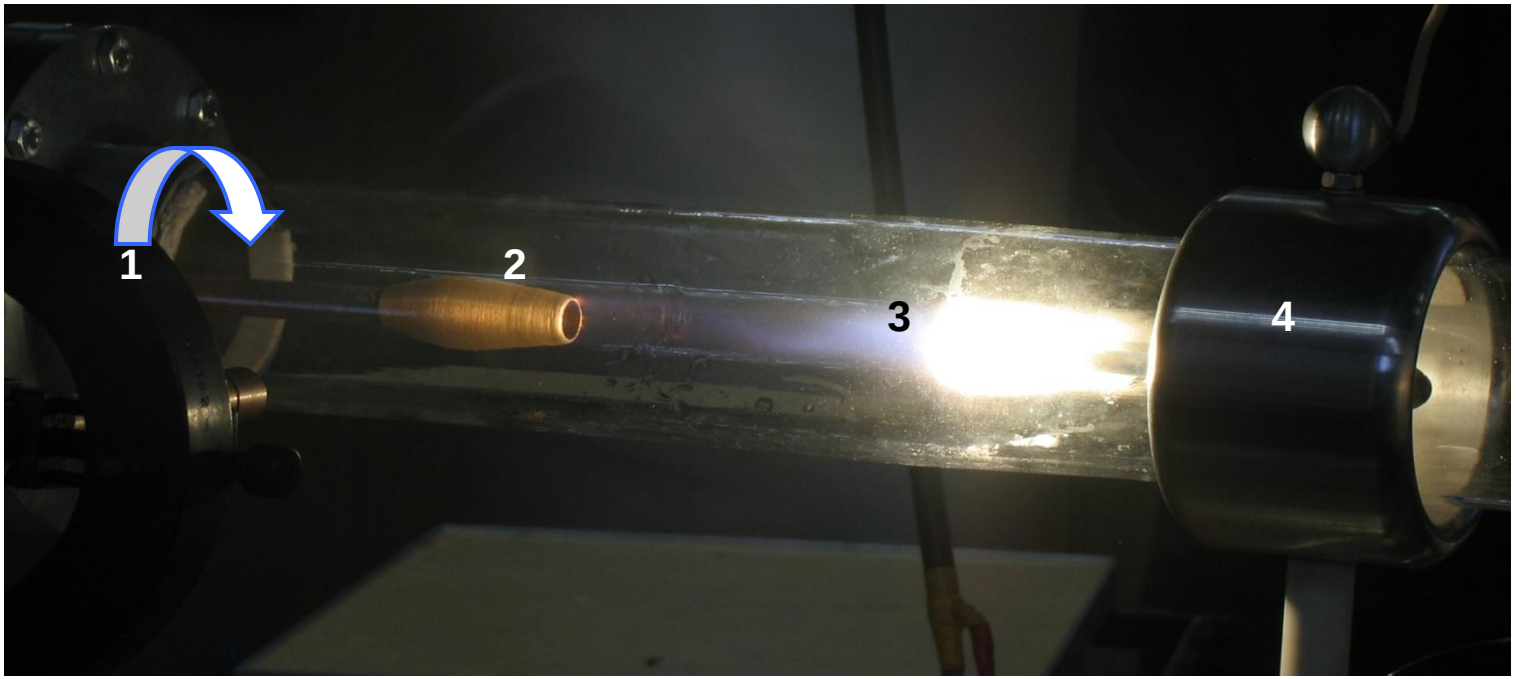
Characteristics and parameters of PVR:

1.	Mean extra power output	1÷10 kW
2.	Testing gas mixture	H_2O: Ar
3.	Mass gas flow	< 10G/s
4.	Combined discharge	HF+DC
5.	Mean power input	0.1÷1 kW
6.	**COP**	**2÷10**

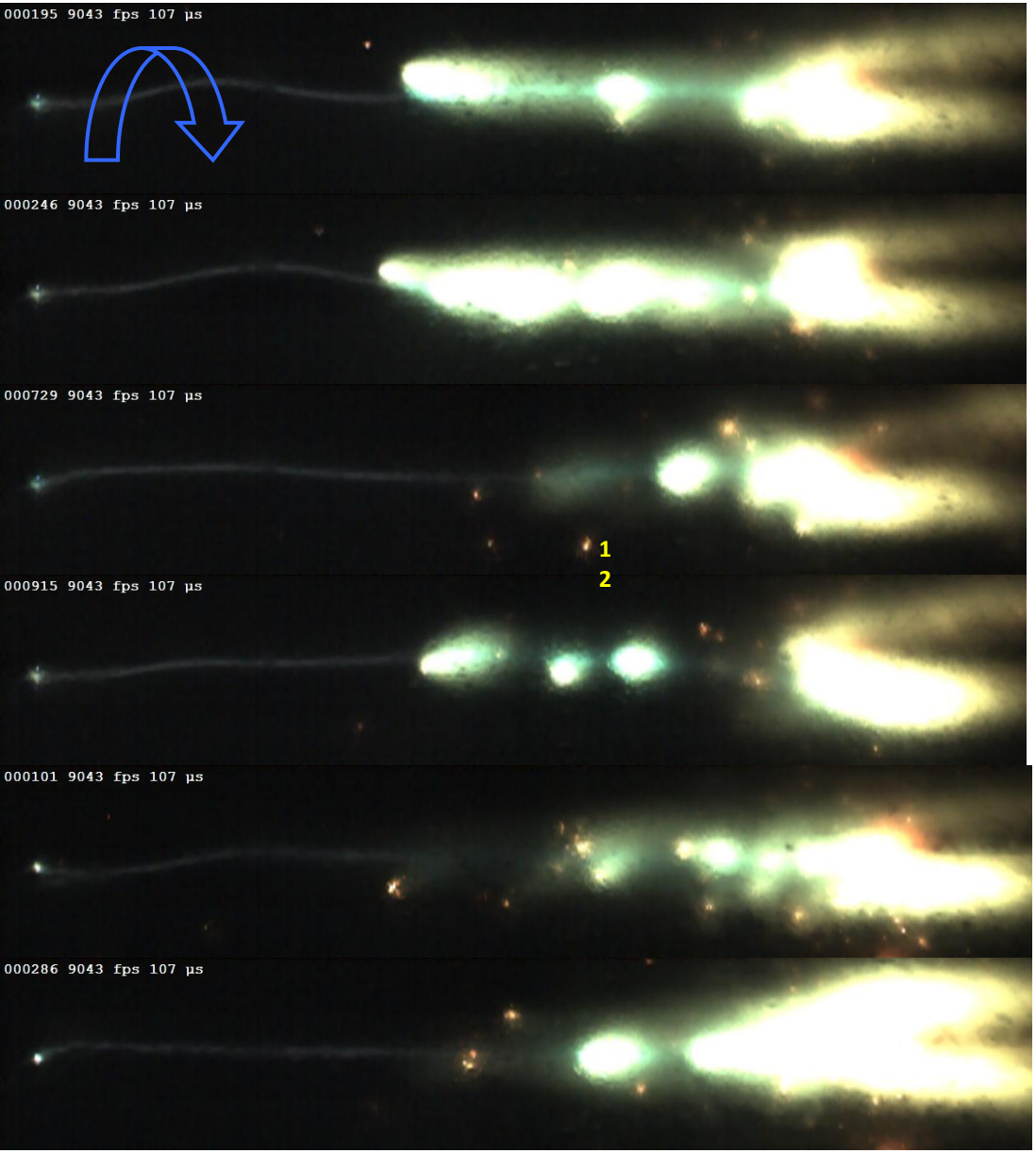
Heterogeneous Plasmoid Created in Swirl Flow.

PVR. Combined Discharge: HFD+ PRD.

Integral photo



Gas mixture Ar : H_20 = 10 :1. Axial velocity V_x is closed tangential velocity V_t: V_x~ V_t ~ 30m/s, P_{st} ~1.5 Bar. 1-swirl generator, 2- water steam injector, 3- erosive metal clusters, 4- cathode

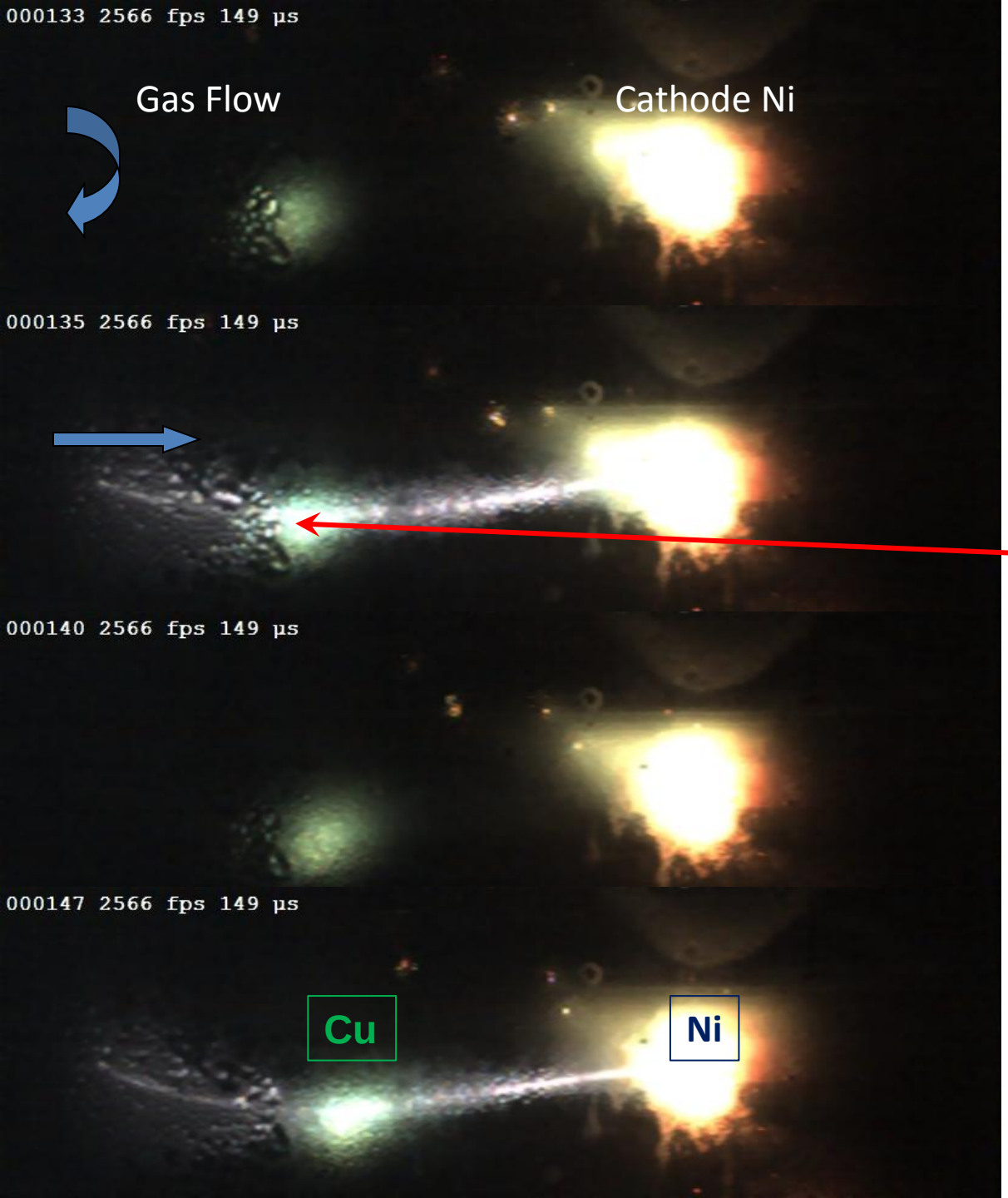


Heterogeneous plasmoid created by pulsed repetitive combined discharge in swirl flow. **PVR**

High-speed video.

Texp~10μs. F=2000Hz

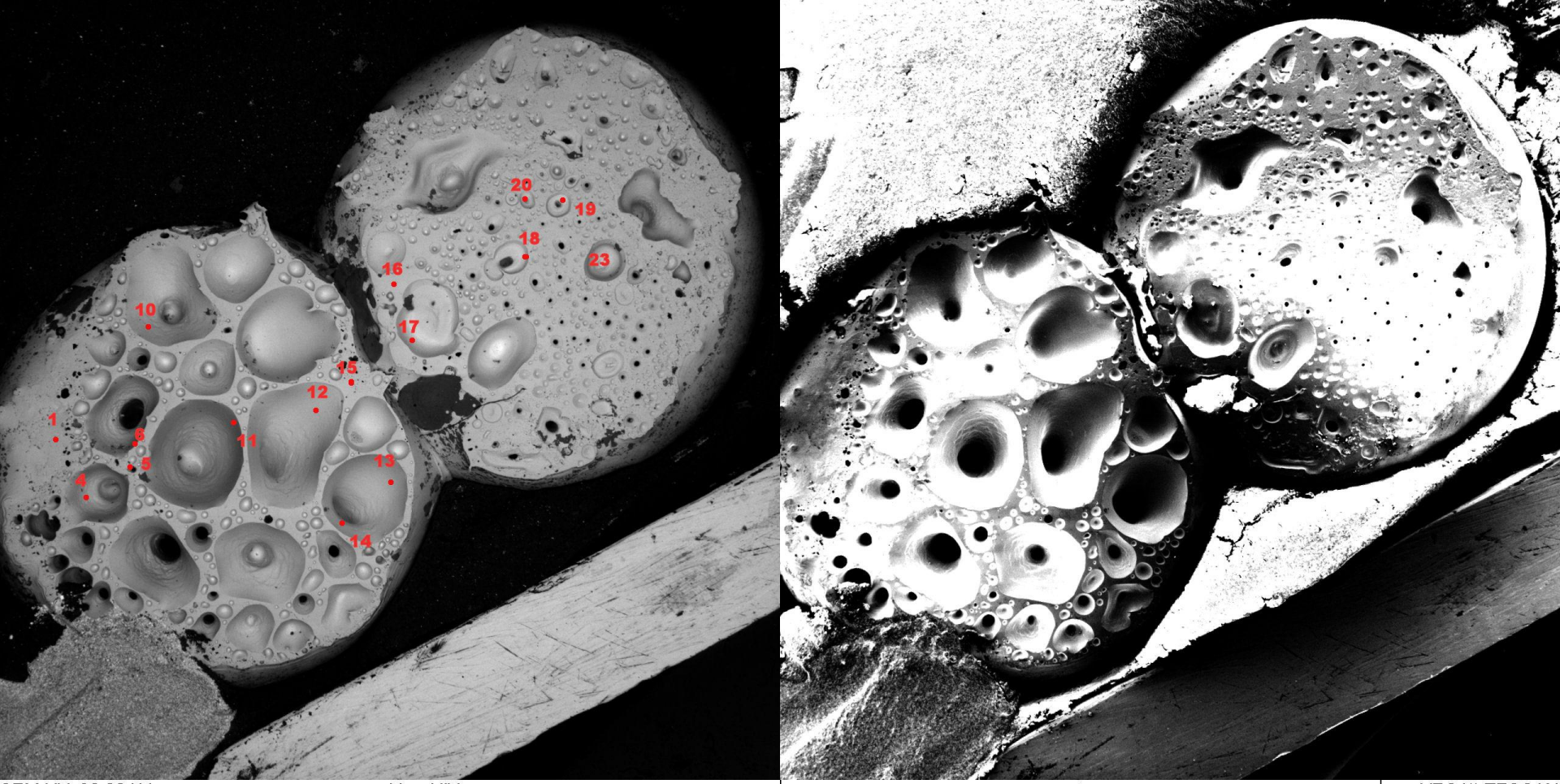
Cathode location- right, anode-left.
Gas mixture Ar : H20 = 10:1.
Axial velocity Vx is closed tangential velocity Vt: Vx~ Vt ~ 30m/s, Pst ~1.5 Bar.
1-metal droplet, 2- plasma halo around droplet



Measurement of plasmoid's potential by electric probe

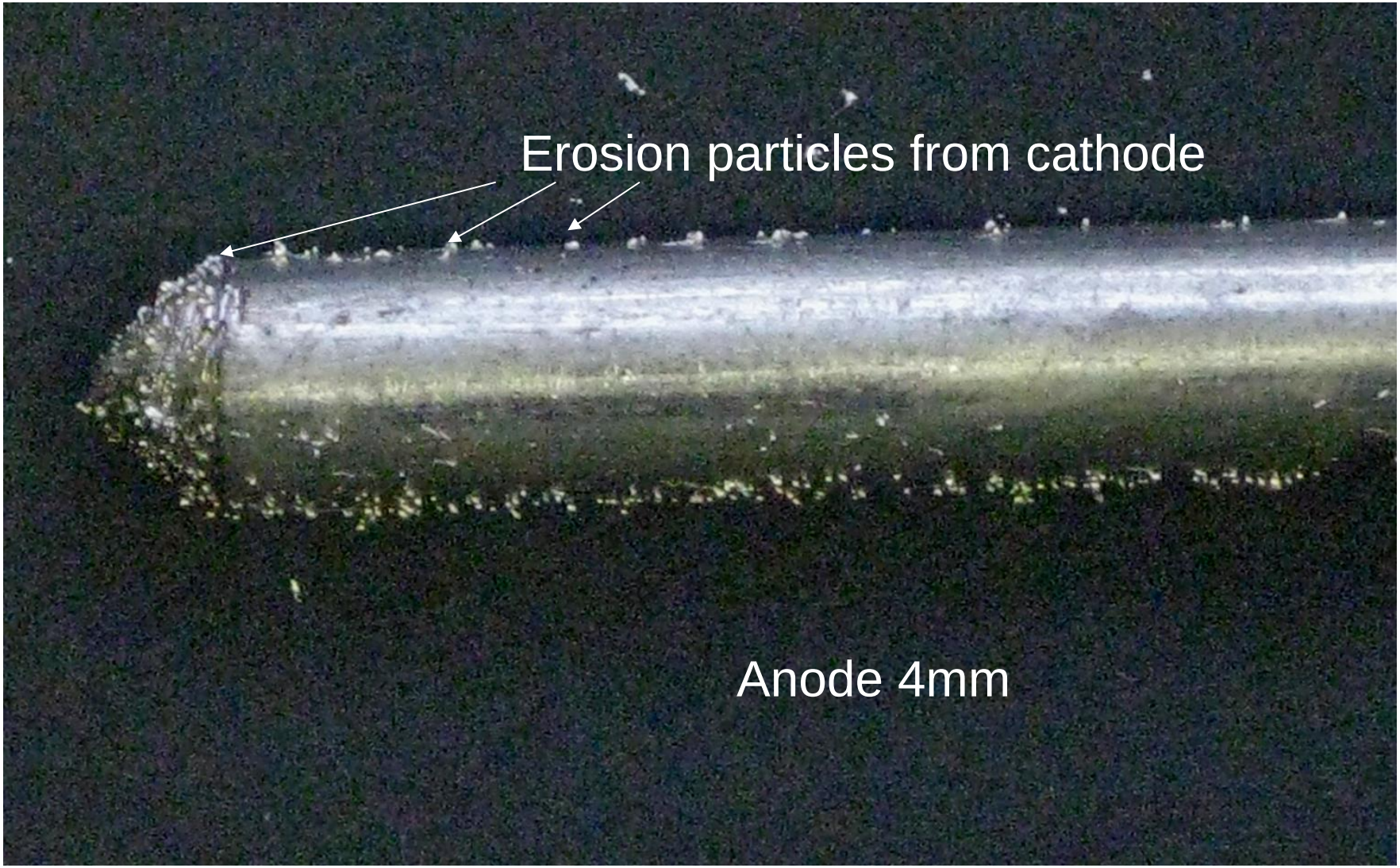
Ni electrodes

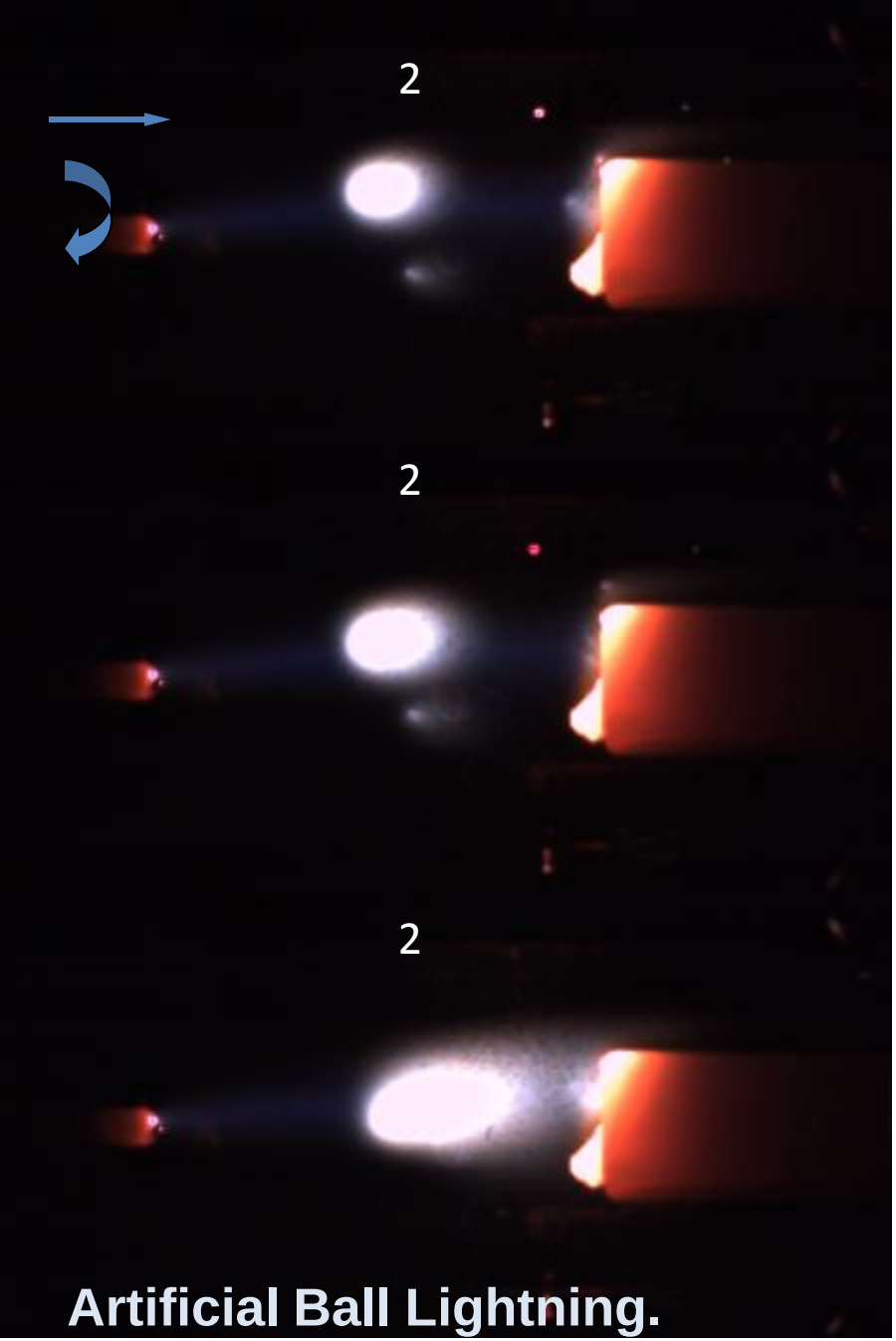
φ_p~ 1 4 kV

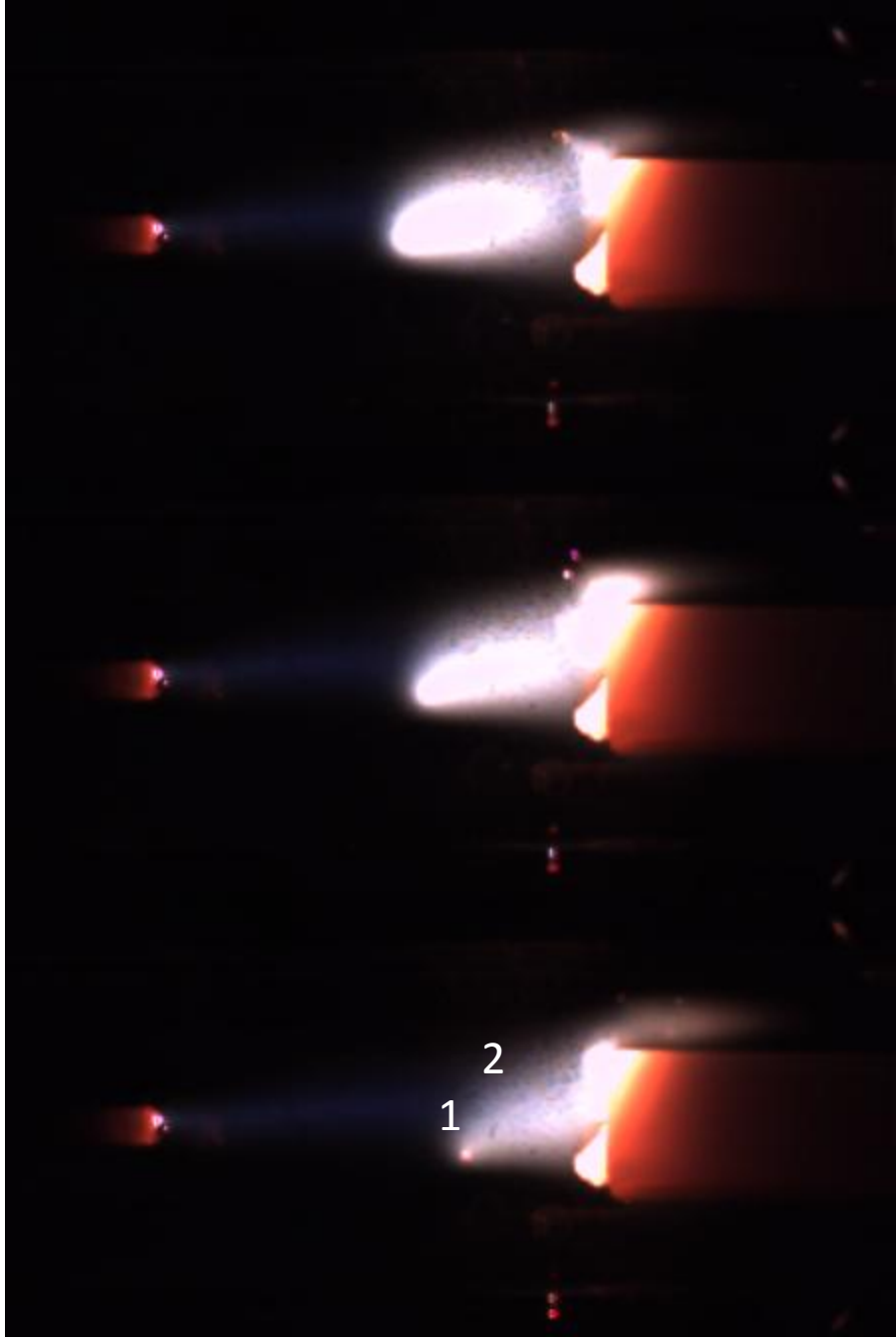


Erosion process in in cathode electrode of PVR.

Deep “mole holes” connected with micro-droplet eruption


Erosion particles from cathode
Anode 4mm





Artificial Ball Lightning.

Non-Neutral Plasmoid in PVR**:** 1- kernel, 2- nano-cluster plasma halo

Specific heat power of “nano-cluster fuel”

- Metal Flow Rate in PVR

$$\delta M = 10^{-3} G/s \longrightarrow \delta N = 10^{19} atom/s$$

- Extra power output in PVR

$$\delta P \sim 3kW$$

- *High specific heat power* of “nano-cluster fuel”

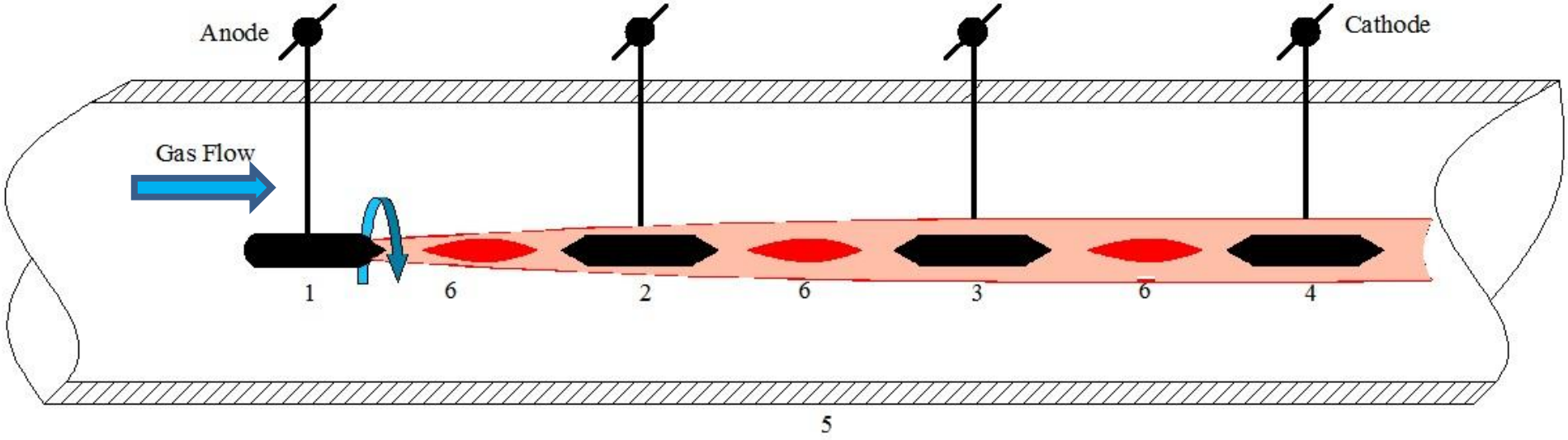
$$Q = \delta P / \delta N = 10^{3}\ eV/atom$$

Part 4

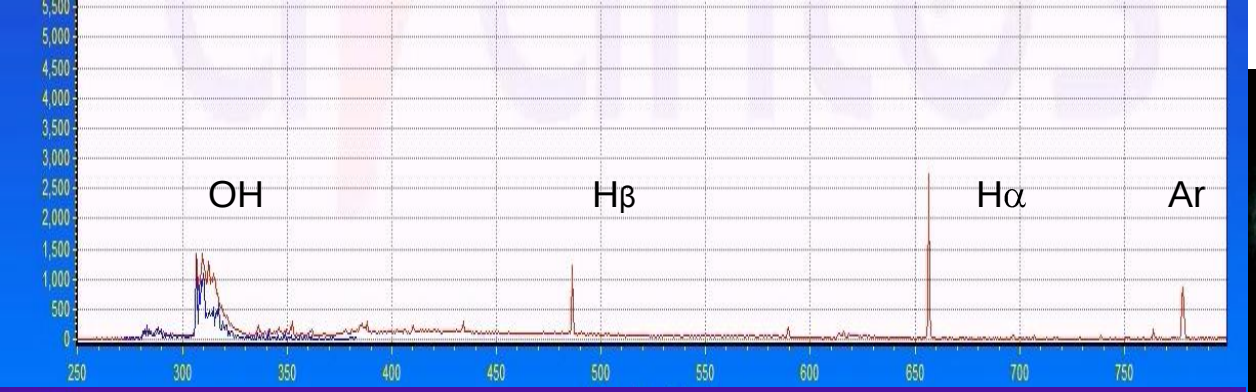
PLASMOID'S EVOLUTION

Scheme of Experimental Set up with Longitudinal Plasmoid.

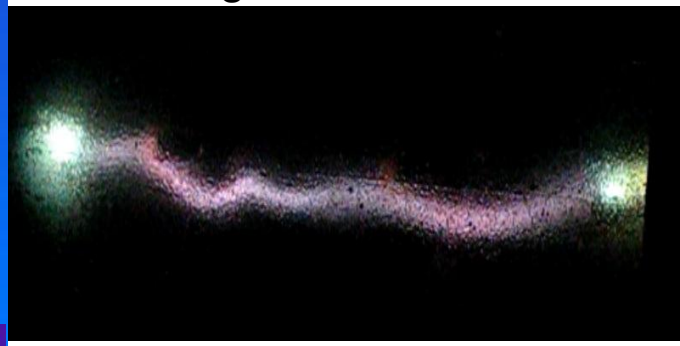
Multi- electrode discharge

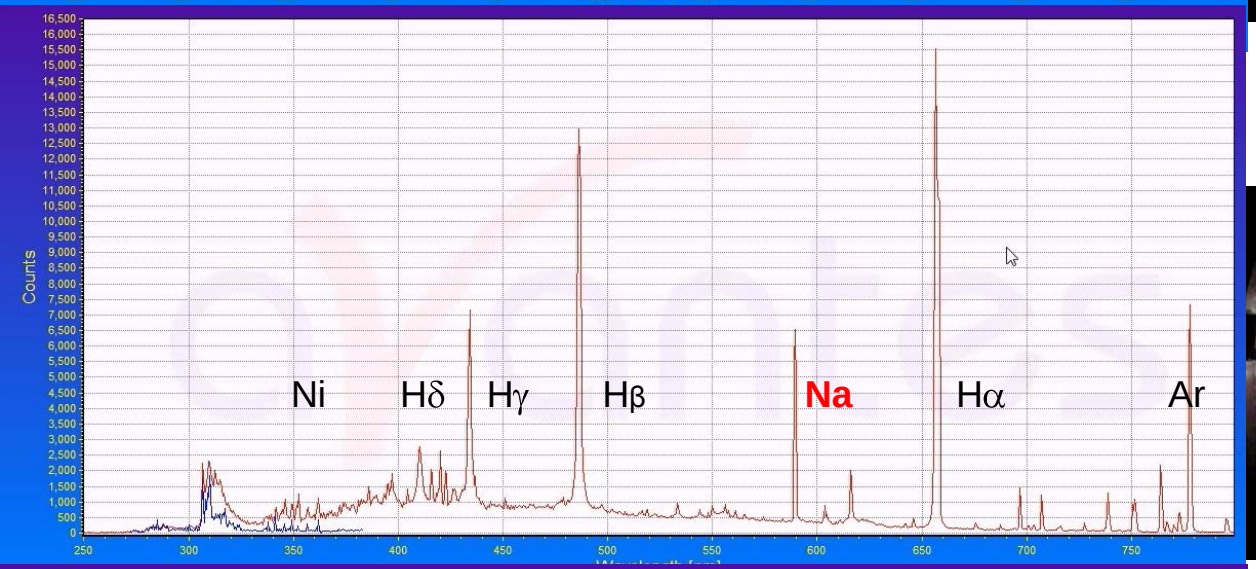


1-anode, 2,3- passive electrode, 4- cathode,5- quartz tube



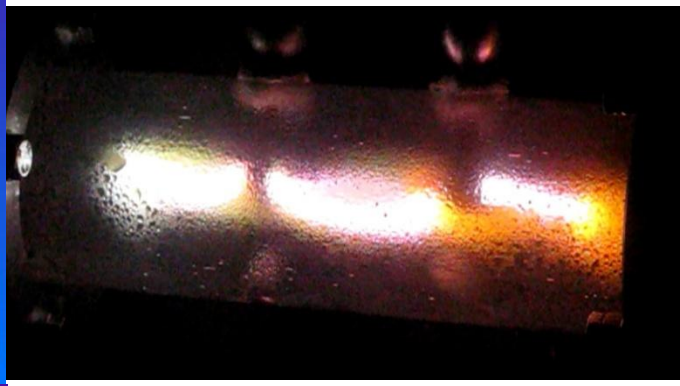
Discharge Start

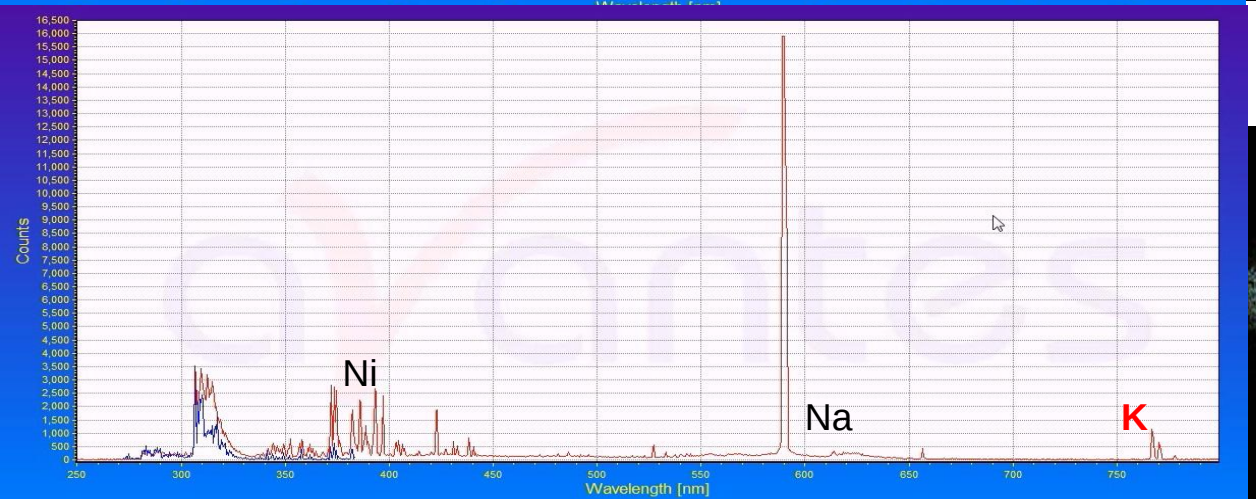




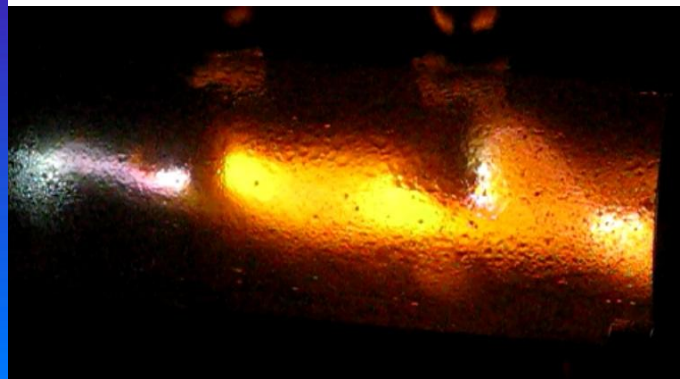
Ar:H2O= 2:1

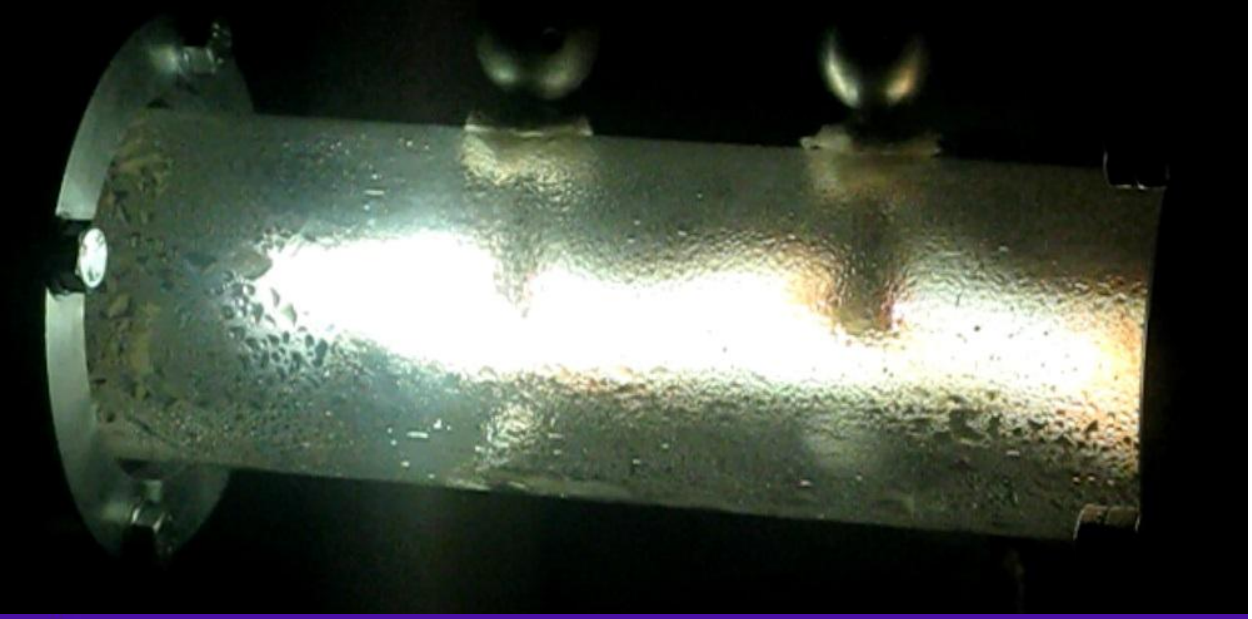
0peration time- 15 s

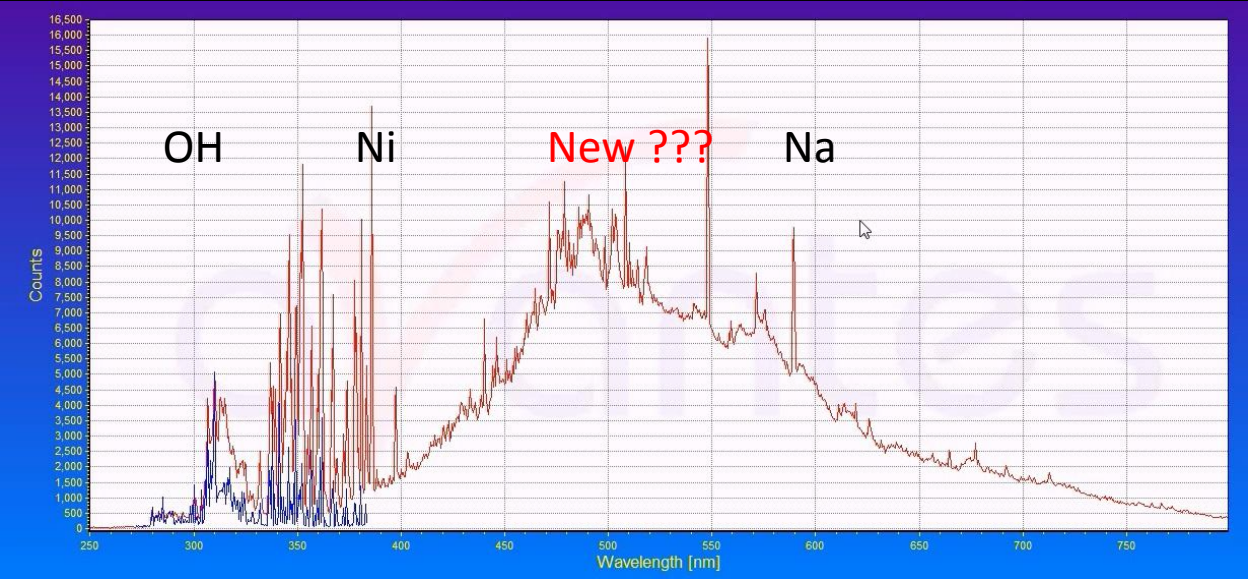




0peration time- 25 s







0peration time- 65 s

Recoding of the optical lines

No hydrogen lines (**Hα, Hβ** ….) in this heterogeneous plasmoid

Absorption of H atoms by plasmoid !!!!

Creation of "new elements"

Part 5

KEY LENR EXPERIMENTS

ПЕРИОДИЧЕСКАЯ СИСТЕМА ХИМИЧЕСКИХ ЭЛЕМЕНТОВ Д.И.МЕНДЕЛЕЕВА

www.calc.ru

Д.И. Менделеев
1834–1907

Периоды	Ряды	ГРУППЫ ЭЛЕМЕНТОВ I а	I б	II а	II б	III а	III б	IV а	IV б	V а	V б	VI а	VI б	VII а	VII б	VIII б	VIII а	Энергетические уровни
1	1	H 1 ВОДОРОД															He 2 ГЕЛИЙ	K
2	2	Li 3 ЛИТИЙ 6,941		Be 4 БЕРИЛЛИЙ 9,0122		B 5 БОР 10,811		C 6 УГЛЕРОД 12,011		N 7 АЗОТ 14,007		O 8 КИСЛОРОД		F 9 ФТОР 18,998			Ne 10 НЕОН 20,179	L
3	3	Na 11 НАТРИЙ 22,99		Mg 12 МАГНИЙ 24,312		Al 13 АЛЮМИНИЙ 26,092		Si 14 КРЕМНИЙ 28,086		P 15 ФОСФОР 30,974		S 16 СЕРА 32,064		Cl 17 ХЛОР 35,453			Ar 18 АРГОН	M
4	4	K 19 КАЛИЙ 39,102		Ca 20 КАЛЬЦИЙ 40,08		Sc 21 СКАНДИЙ 44,956		Ti 22 ТИТАН 47,956		V 23 ВАНАДИЙ 50,941		Cr 24 ХРОМ 51,996		Mn 25 МАРГАНЕЦ 54,938		Fe 26 ЖЕЛЕЗО 55,849	Co 27 КОБАЛЬТ 58,933 Ni 28 НИКЕЛЬ 58,7	N
	5	Cu 29 МЕДЬ 63,546		Zn 30 ЦИНК 65,37		Ga 31 ГАЛЛИЙ 69,72		Ge 32 ГЕРМАНИЙ 72,59		As 33 МЫШЬЯК 74,922		Se 34 СЕЛЕН 78,96		Br 35 БРОМ 79,904			Kr 36 КРИПТОН 83,8	O
5	6	Rb 37 РУБИДИЙ 85,468		Sr 38 СТРОНЦИЙ 87,62		Y 39 ИТТРИЙ 88,906		Zr 40 ЦИРКОНИЙ 91,22		Nb 41 НИОБИЙ 92,906		Mo 42 МОЛИБДЕН 95,94		Tc 43 ТЕХНЕЦИЙ [99]		Ru 44 РУТЕНИЙ 101,07	Rh 45 РОДИЙ 102,906 Pd 46 ПАЛЛАДИЙ 106,4	P
	7	Ag 47 СЕРЕБРО 107,868		Cd 48 КАДМИЙ 112,41		In 49 ИНДИЙ 114,82		Sn 50 ОЛОВО 118,69		Sb 51 СУРЬМА 121,75		Te 52 ТЕЛЛУР 127,6		I 53 ИОД 126,905			Xe 54 КСЕНОН 131,3	O
6	8	Cs 55 ЦЕЗИЙ 132,905		Ba 56 БАРИЙ 137,34		57–71 ЛАНТАНОИДЫ		Hf 72 ГАФНИЙ 178,49		Ta 73 ТАНТАЛ 180,948		W 74 ВОЛЬФРАМ 183,85		Re 75 РЕНИЙ 186,207		Os 76 ОСМИЙ 190,2	Ir 77 ИРИДИЙ 192,22 Pt 78 ПЛАТИНА 195,09	P
	9	Au 79 ЗОЛОТО 196,967		Hg 80 РТУТЬ 200,59		Tl 81 ТАЛЛИЙ 204,37		Pb 82 СВИНЕЦ 207,19		Bi 83 ВИСМУТ 208,98		Po 84 ПОЛОНИЙ [210]		At 85 АСТАТ [210]			Rn 86 РАДОН [222]	O
7	10	Fr 87 ФРАНЦИЙ [223]		Ra 88 РАДИЙ [226]		89–103 АКТИНОИДЫ		Rf 104 РЕЗЕРФОРДИЙ [261]		Db 105 ДУБНИЙ [262]		Sg 106 СИБОРГИЙ [263]		Bh 107 БОРИЙ [262]		Hn 108 ХАНИЙ [265]	Mt 109 МЕЙТНЕРИЙ 110	P
ВЫСШИЕ ОКСИДЫ		R_2O		RO		R_2O_3		RO_2		R_2O_5		RO_3		R_2O_7		RO_4		
ЛЕТУЧИЕ ВОДОРОДНЫЕ СОЕДИНЕНИЯ								RH_4		RH_3		H_2R		HR				

ЛАНТАНОИДЫ

57 La ЛАНТАН 138,906	58 Ce ЦЕРИЙ 140,12	59 Pr ПРАЗЕОДИМ 140,908	60 Nd НЕОДИМ 144,24	61 Pm ПРОМЕТИЙ [145]	62 Sm САМАРИЙ 150,4	63 Eu ЕВРОПИЙ 151,96	64 Gd ГАДОЛИНИЙ 157,25	65 Tb ТЕРБИЙ 158,926	66 Dy ДИСПРОЗИЙ 162,5	67 Ho ГОЛЬМИЙ 164,93	68 Er ЭРБИЙ 167,26	69 Tm ТУЛИЙ 168,934	70 Yb ИТТЕРБИЙ 173,04	71 Lu ЛЮТЕЦИЙ 174,97

АКТИНОИДЫ

89 Ac АКТИНИЙ [227]	90 Th ТОРИЙ 232,038	91 Pa ПРОТАКТИНИЙ [231]	92 U УРАН 238,29	93 Np НЕПТУНИЙ [237]	94 Pu ПЛУТОНИЙ [244]	95 Am АМЕРИЦИЙ [243]	96 Cm КЮРИЙ [247]	97 Bk БЕРКЛИЙ [247]	98 Cf КАЛИФОРНИЙ [251]	99 Es ЭЙНШТЕЙНИЙ [254]	100 Fm ФЕРМИЙ [257]	101 Md МЕНДЕЛЕВИЙ [258]	102 No НОБЕЛИЙ [259]	103 Lr ЛОУРЕНСИЙ [260]

СИМВОЛ ЭЛЕМЕНТА

ПОРЯДКОВЫЙ НОМЕР

Rb 37 РУБИДИЙ 85,468

НАЗВАНИЕ ЭЛЕМЕНТА

ОТНОСИТЕЛЬНАЯ АТОМНАЯ МАССА

РАСПРЕДЕЛЕНИЕ ЭЛЕКТРОНОВ ПО СЛОЯМ

s-элементы

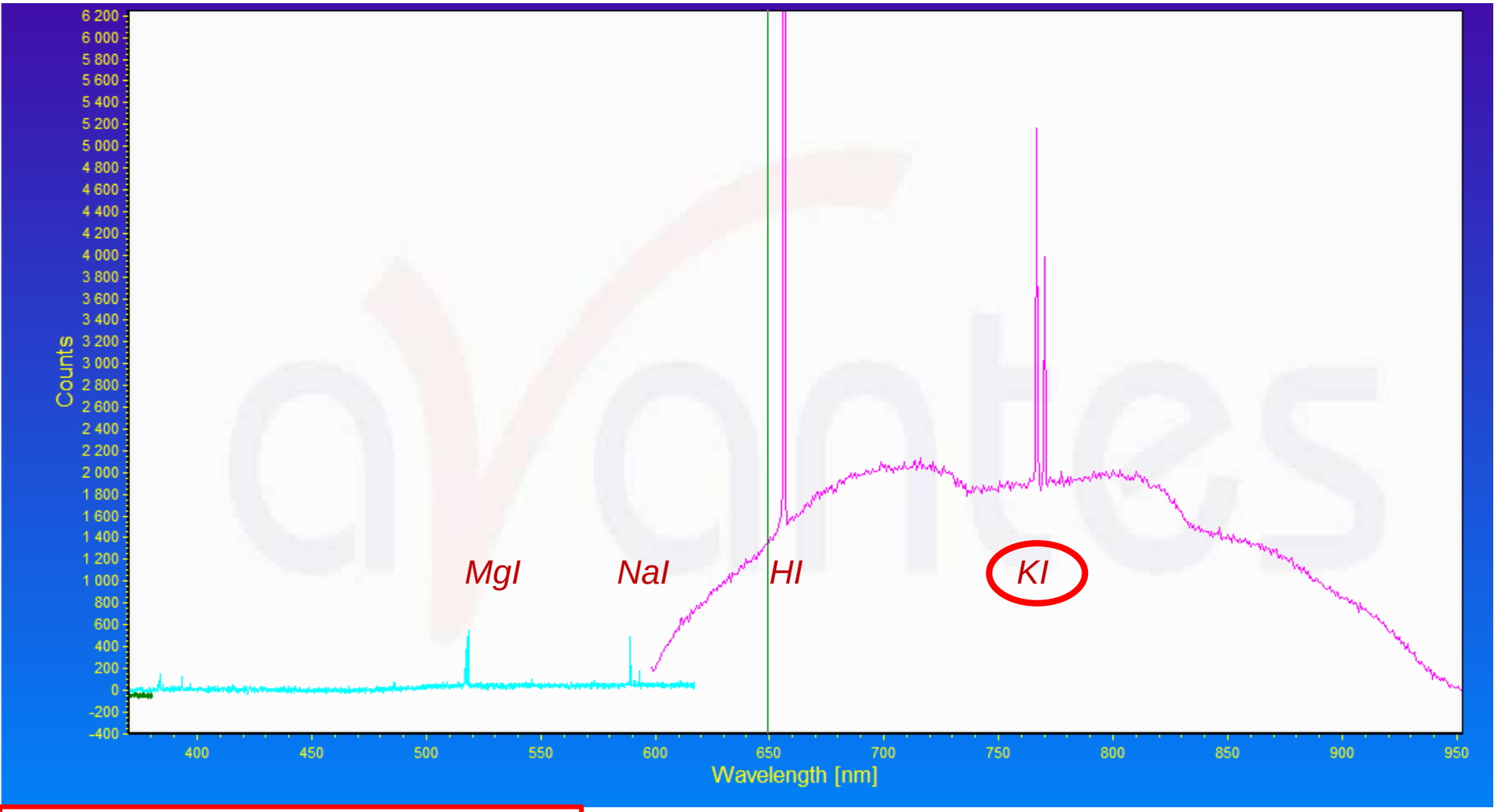
p-элементы

d-элементы

f-элементы

Input: **H2O (H,O), He, Ar, +Ni** → Output: **Li, K, Cu, Zn**

Optical Spectrum of Heterogeneous Plasma in Gas Mixture: $Ar + H_2$.

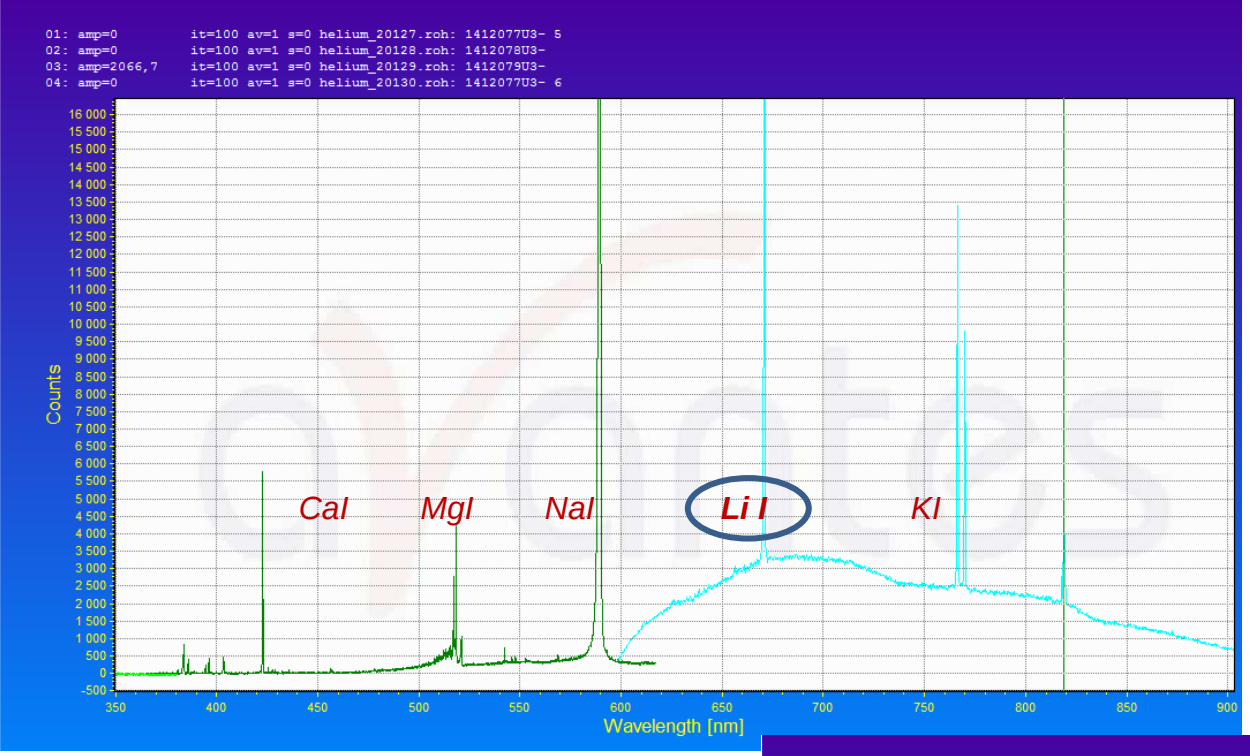


$$Ar^{18}_{36,38,40} + H^{1}_{1} = K^{19}_{39,41} \quad (2)$$

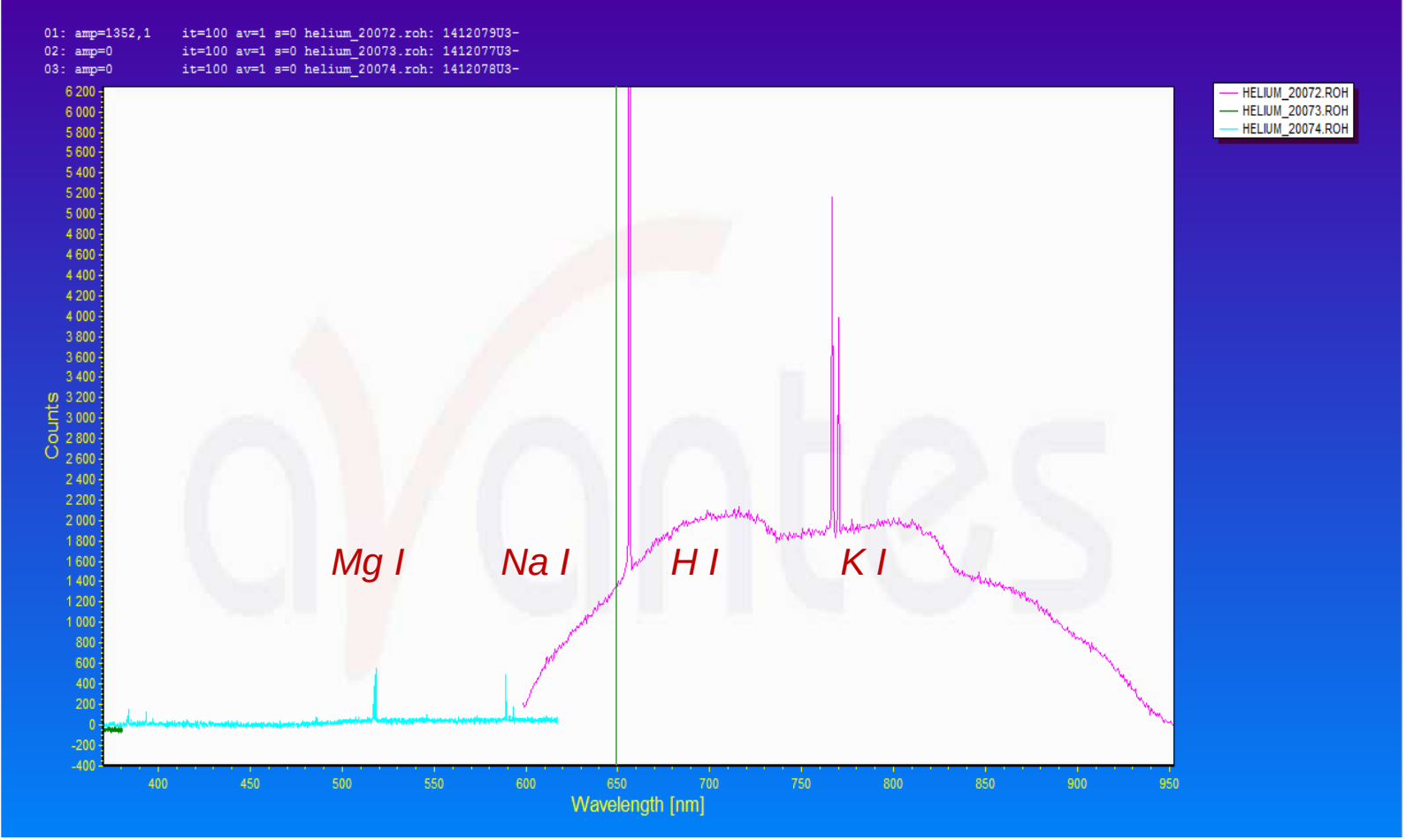
$$O^{8}_{16,17,18} + He^{2}_{4} + He^{2}_{4} = Mg^{12}_{24,25,26} \quad (4),$$

$$Na^{11}_{23} + H^{1}_{1} = Mg^{12}_{24} \quad (5).$$

Optical Spectrum of Heterogeneous Plasma in Gas Mixture: $He + H_2$. PVR



$$He^{2}_{3,4} + H^{1}_{1,2} = Li^{3}_{6,7}$$



Optical Spectrum of Heterogeneous Plasma in Gas Mixture: Ar + H_2O= 1: 1

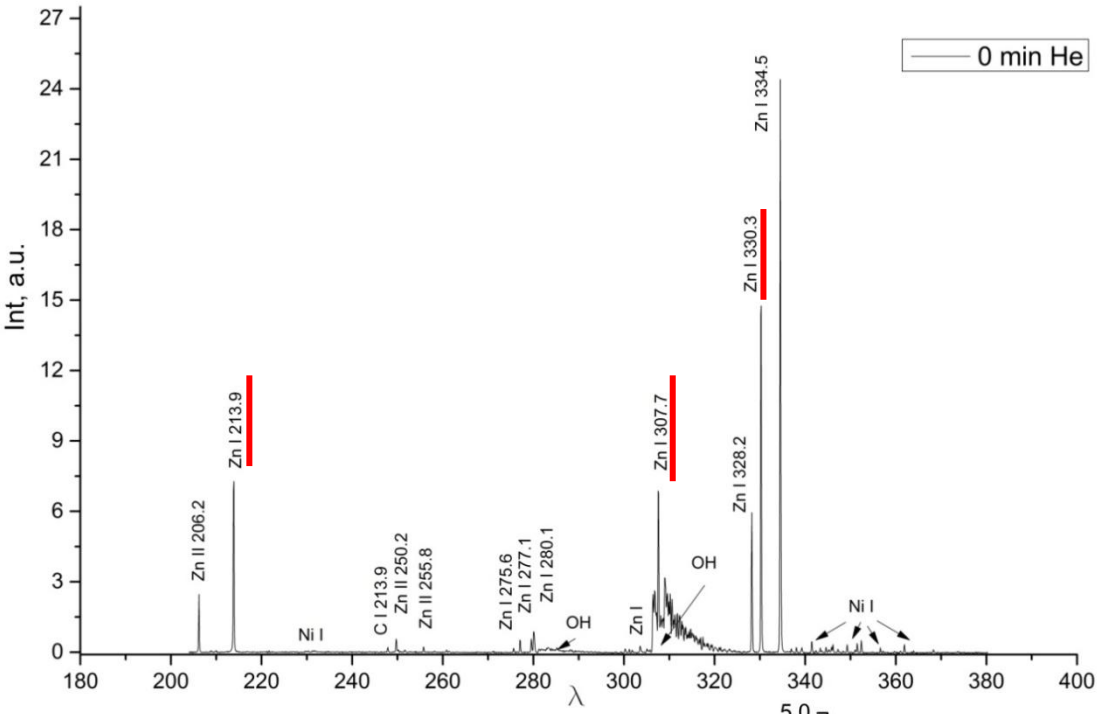
No lines **Li I**

$$O^{8}_{16,\,17,18} + He^{2}_{4} + He^{2}_{4} = Mg^{12}_{24,25,26} \qquad (4),$$

$$Na^{11}_{23} + H^{1}_{1} = Mg^{12}_{24} \qquad (5).$$

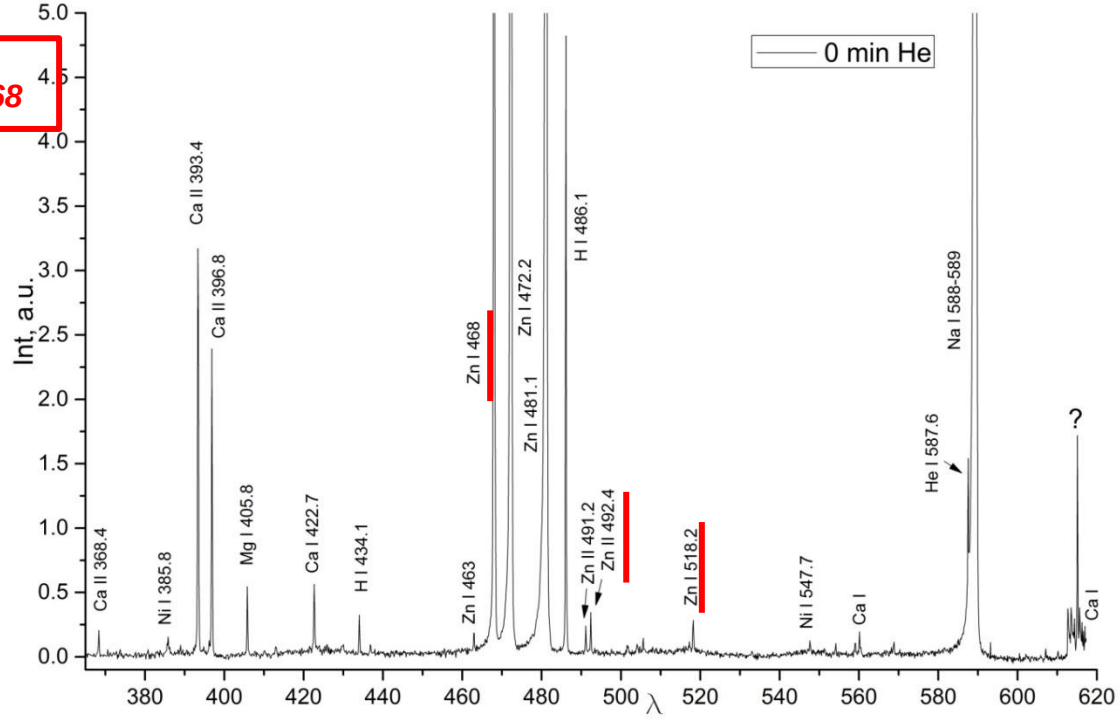
Optical Spectrum of Heterogeneous Plasma in Gas Mixture:

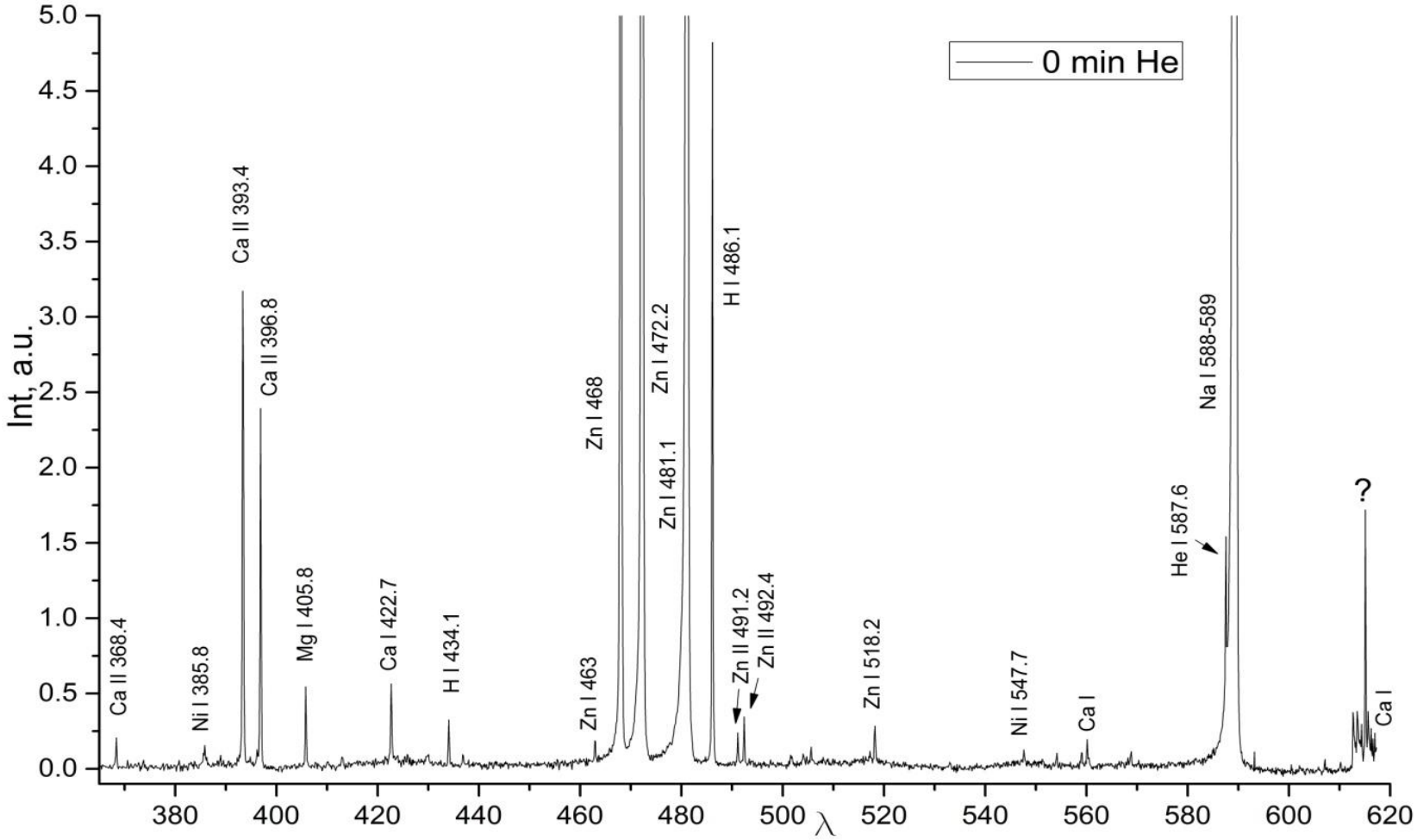
$He+H_2O= 95:5$



$$Ni^{28}{}_{58,60,61,62,64} + He^{2}{}_{4} = Zn^{30}{}_{64,66,68}$$

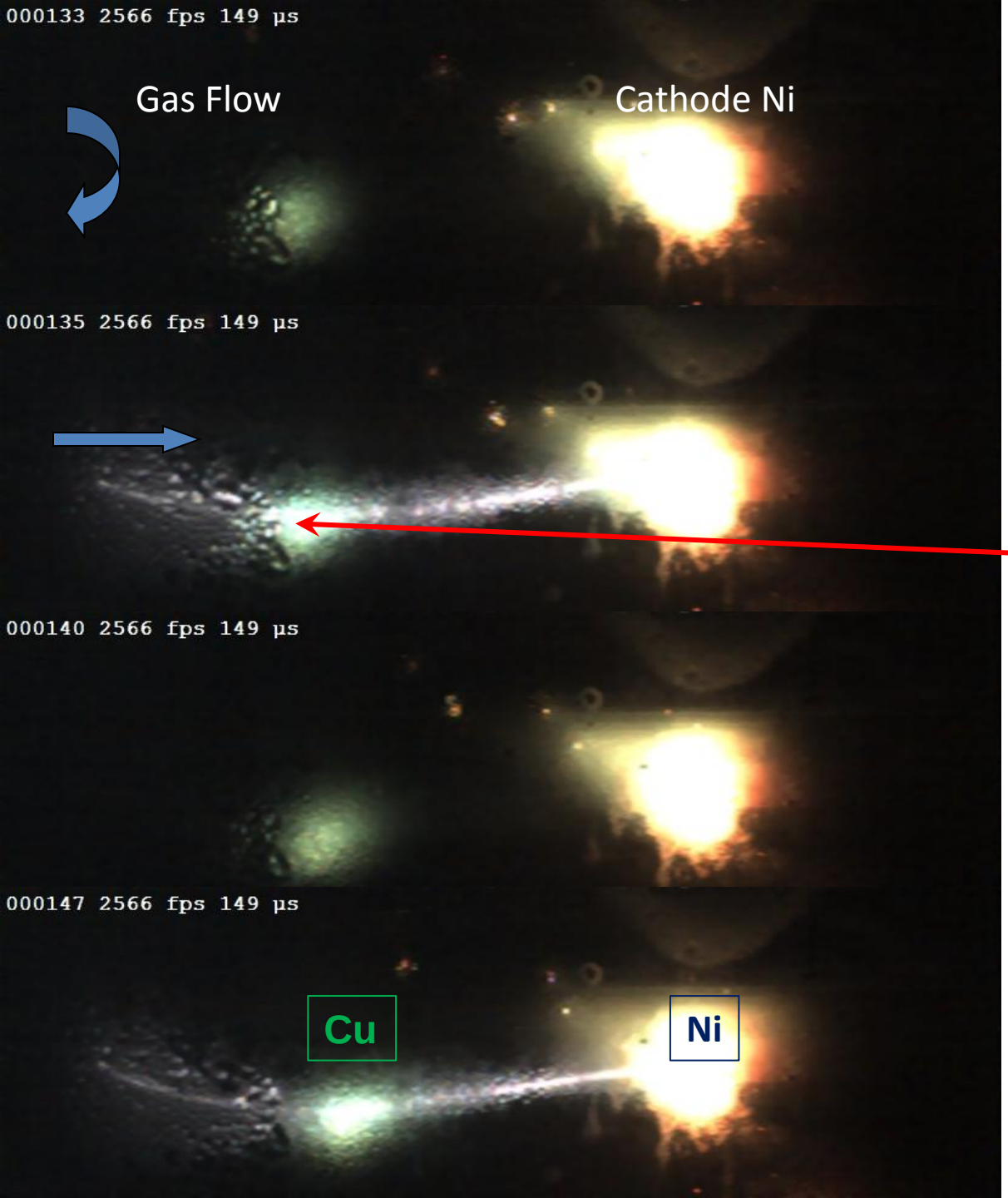
Zn, Ni, Ca, Ca II, Mg, He, Na, H, O, K





$$Ni^{28}{}_{58,60,61,62,64} + He^{2}{}_{4} = Zn^{30}{}_{64,66,68}$$

Zn, Ni, Ca, Ca II, Mg, He, Na, H, O, K



Measurement of plasmoid's potential by electric probe

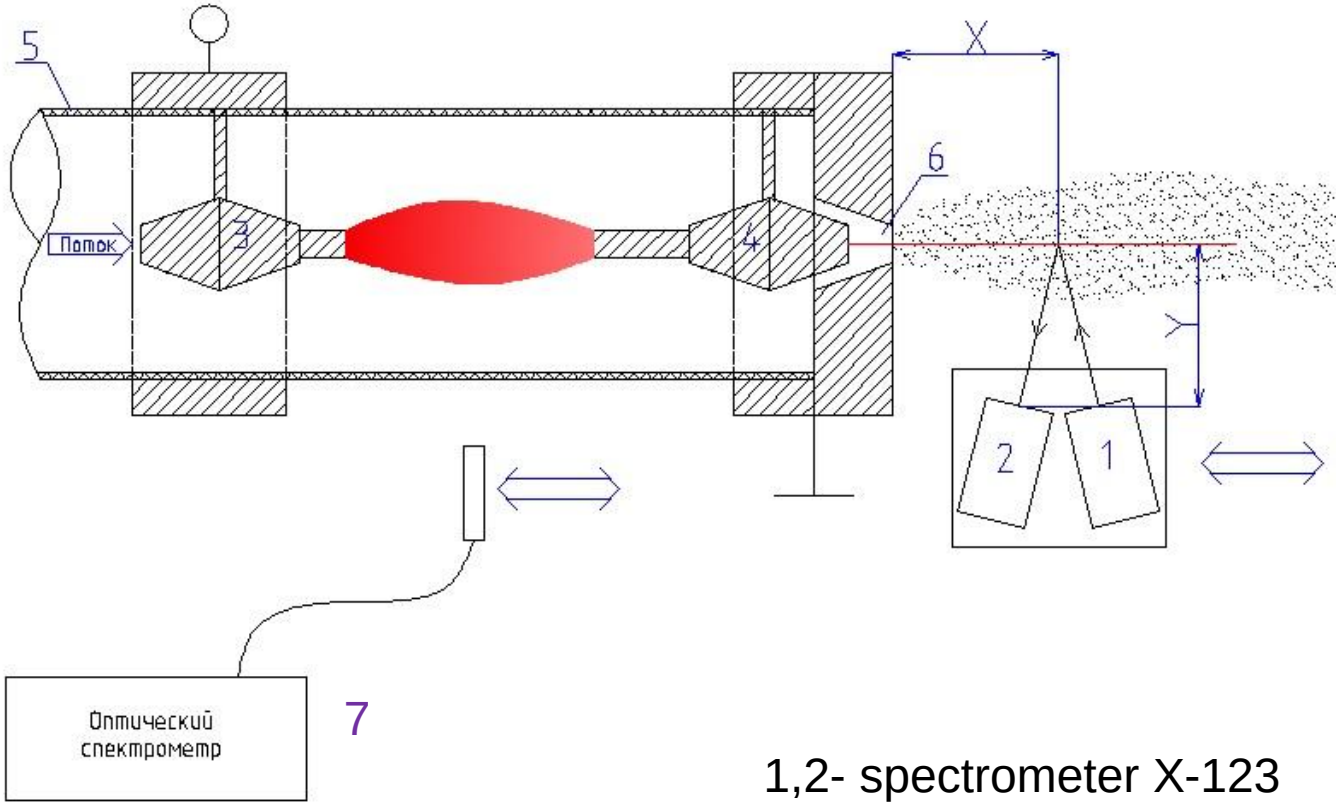
Ni electrodes

φ_p~ 1 4 kV

Part 4

X-RADIATION FROM HETEROGENEOUS PLASMOID

Measurements of X-Radiation from Heterogeneous Plasmoid in PVR



1,2- spectrometer X-123
3,4- electrodes
5 –quartz tube (test section)
6-PVR’s nozzle
7- optical spectrometer AvaSpec 2048

Блоки детектирования рентгеновского излучения

БДЭР

Блоки детектирования (БДЭР) предназначены для регистрации и спектрометрии рентгеновского излучения.

Блоки детектирования осуществляют преобразование поглощенной в чувствительном объеме детектора энергии рентгеновского излучения в электрические импульсы пропорциональной амплитуды.

Блоки детектирования (БДЭР) выполнены на основе детектирующих p-i-n структур производства фирмы АМРТЕК (США).

Блоки детектирования (БДЭР) выпускаются различных геометрических параметров с площадью чувствительной поверхности 5 и 25 мм^2.

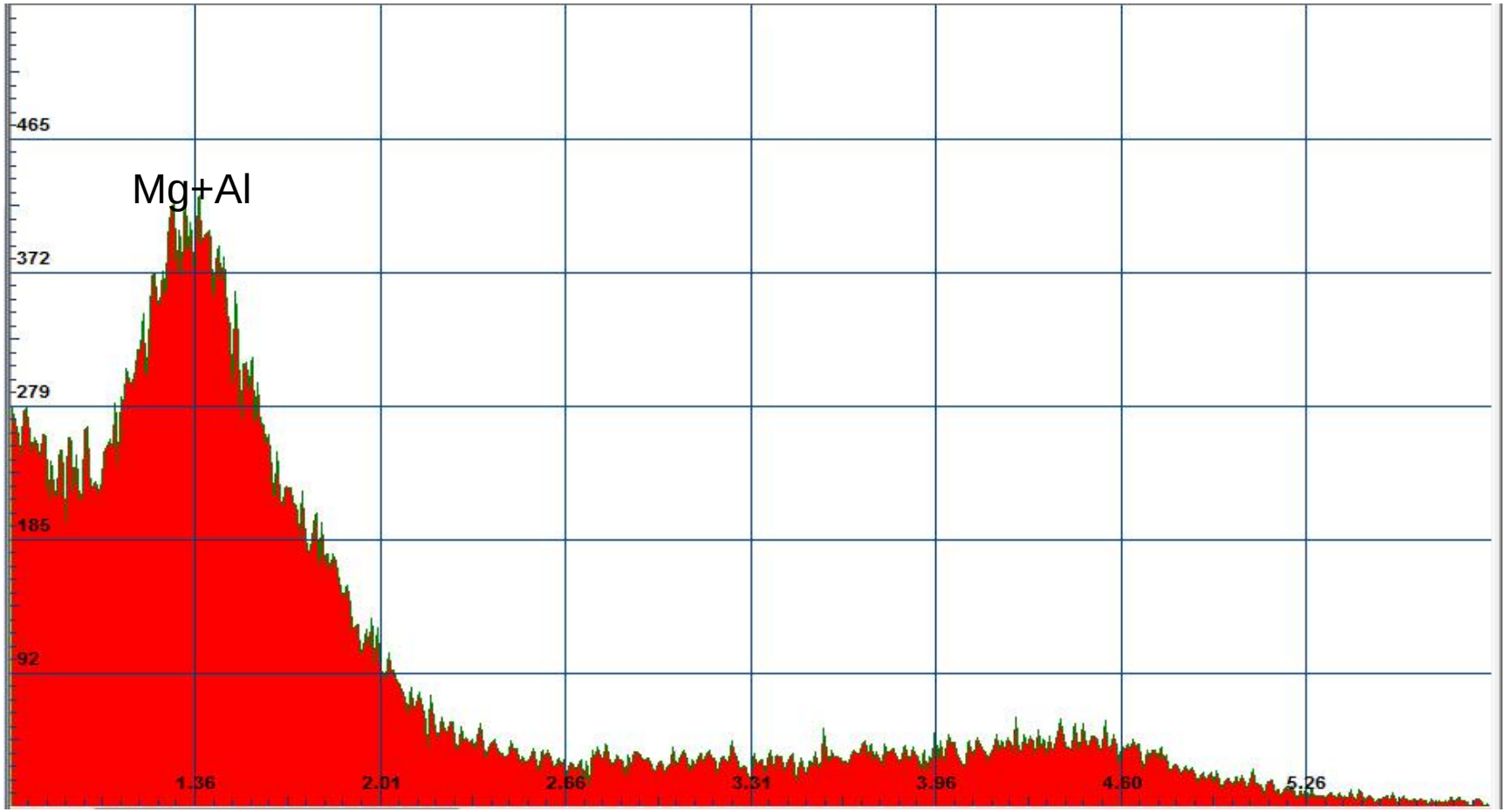
Основные параметры и характеристики:

- Амплитудное разрешение БД, определенное по линии 5,9 кэВ нуклида железо-59 не более:
  - 170 эВ при площади 5 мм^2;
  - 220 эВ при площади 25 мм^2.
- БД обеспечивают работу в диапазоне энергий фотонов от 0,5 кэВ до 50 кэВ.
- Интегральная нелинейность характеристики преобразования не более ±0,25 %.
- Максимальная выходная статистическая загрузка 5•10^4 с$^{-1}$.
- Время установления рабочего режима не более 15 мин.
- Время непрерывной работы не менее 24 ч.
- Блок детектирования устойчив к воздействию температуры от 10 °С до 40 °С.

ГП "ГРИН СТАР"
Тел./Факс: (499) 943 2031, тел.: (499) 943 2794
Адрес: 123060, г.Москва, ул.Расплетина, д.5.
ФГУП "НИЦ СНИИП"
www.greenstar.ru, e-mail: grstar@mega.ru

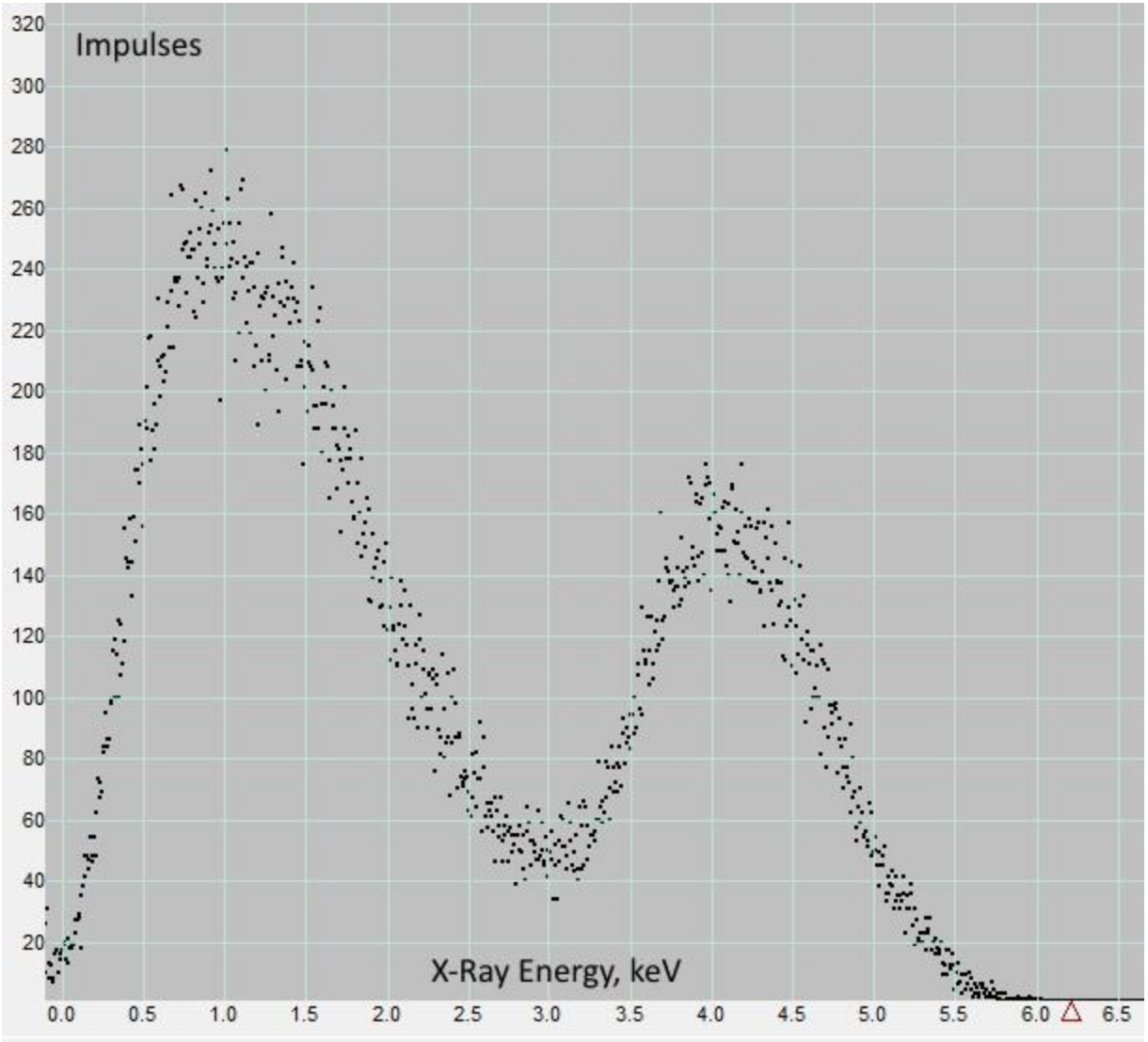
ГРИН СТАР
ГРУППА ПРЕДПРИЯТИЙ

X- Radiation from Heterogeneous Plasma in PVR. X-123

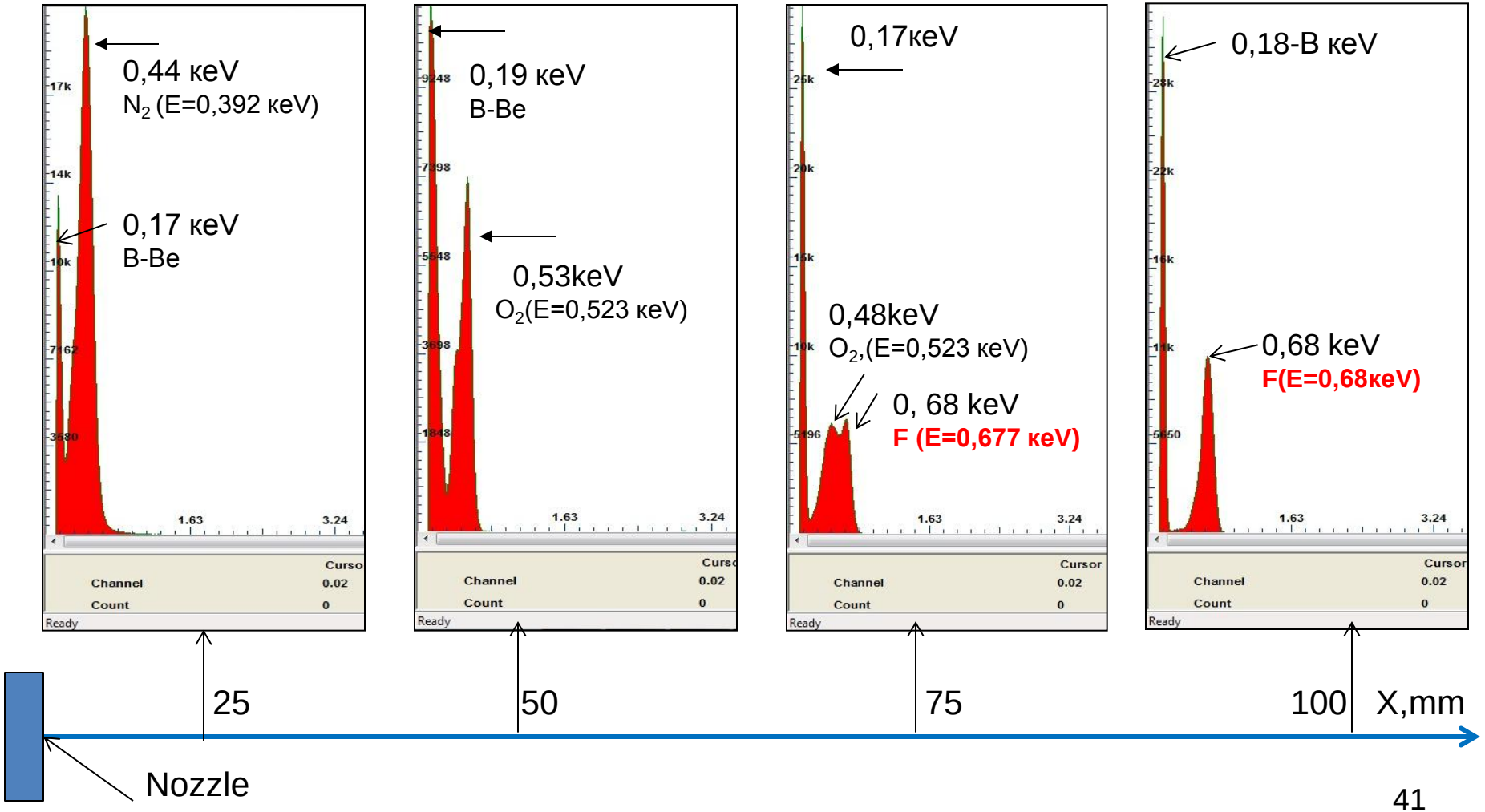


The combined discharge (DC+HF), a mean power - 500W, *the hot electrode –cathode*

X- Radiation from Heterogeneous Plasma behind PVR's nozzle (JHTI& NIChM). *BDER*



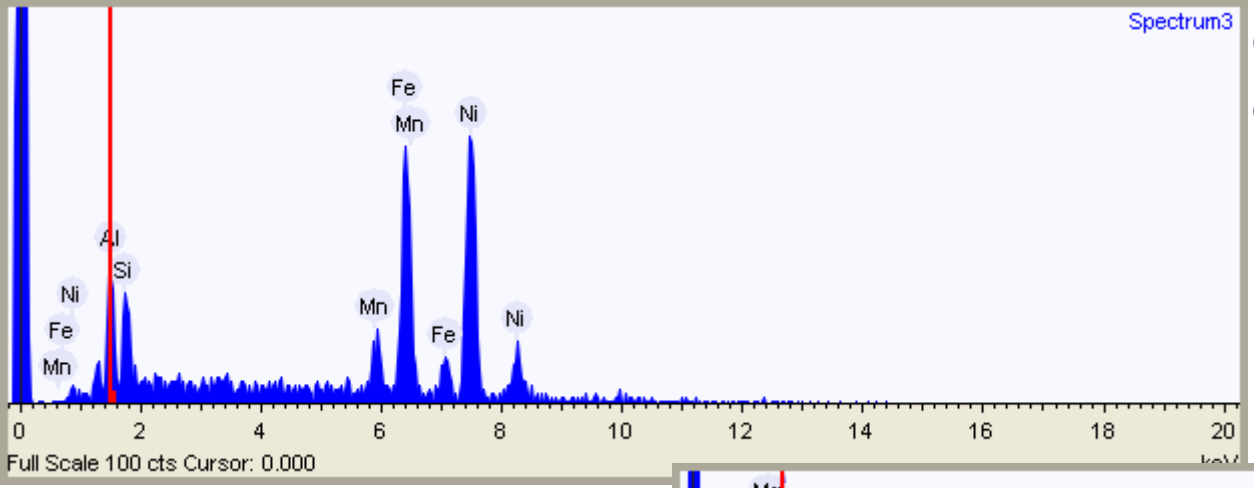
Spatial Evolution of X- Spectra in Heterogeneous Plasma. Jet from PVR's Nozzle



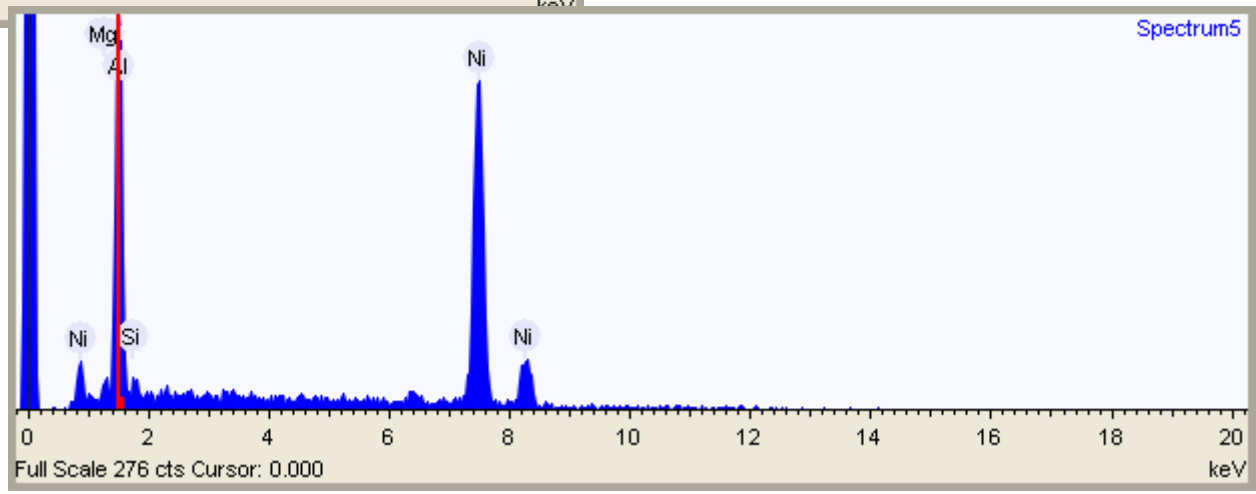
Transmutation of Chemical Elements in Heterogeneous Plasmoid

Chemical Composition of Ni- electrode's surface

Initial electrode: **Ni- 99.99%**



Exposed electrode
Tp~ 360c

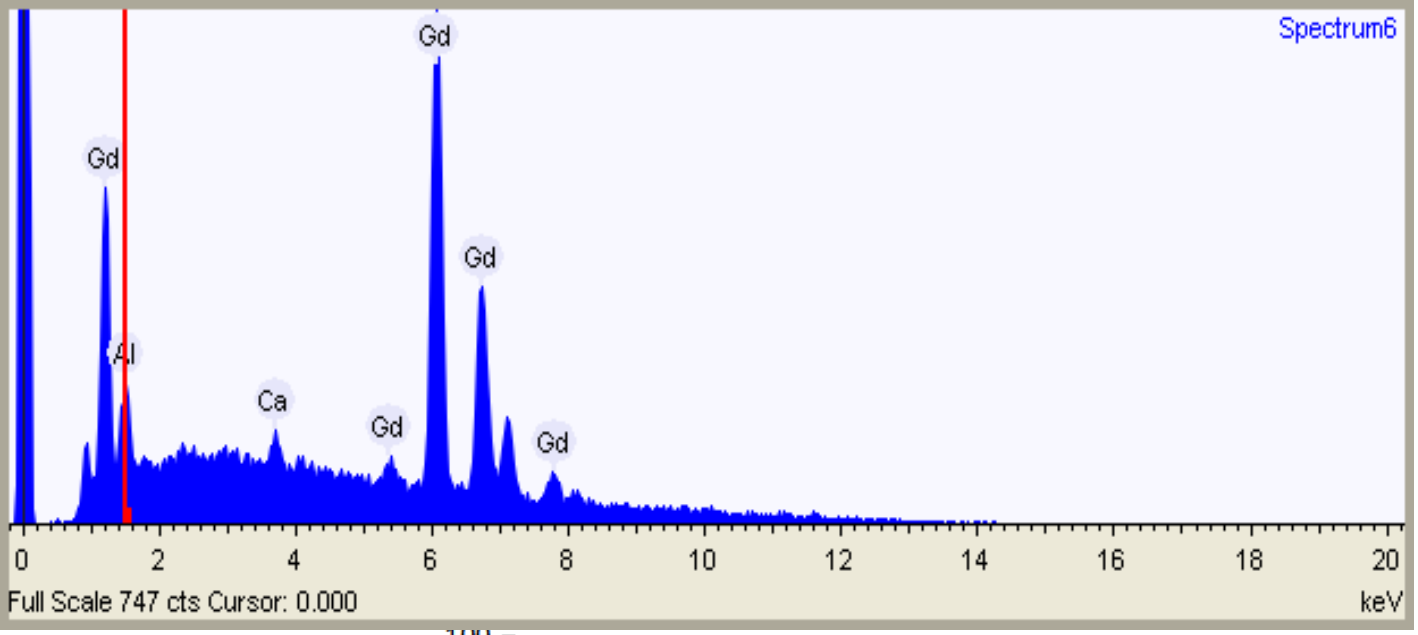


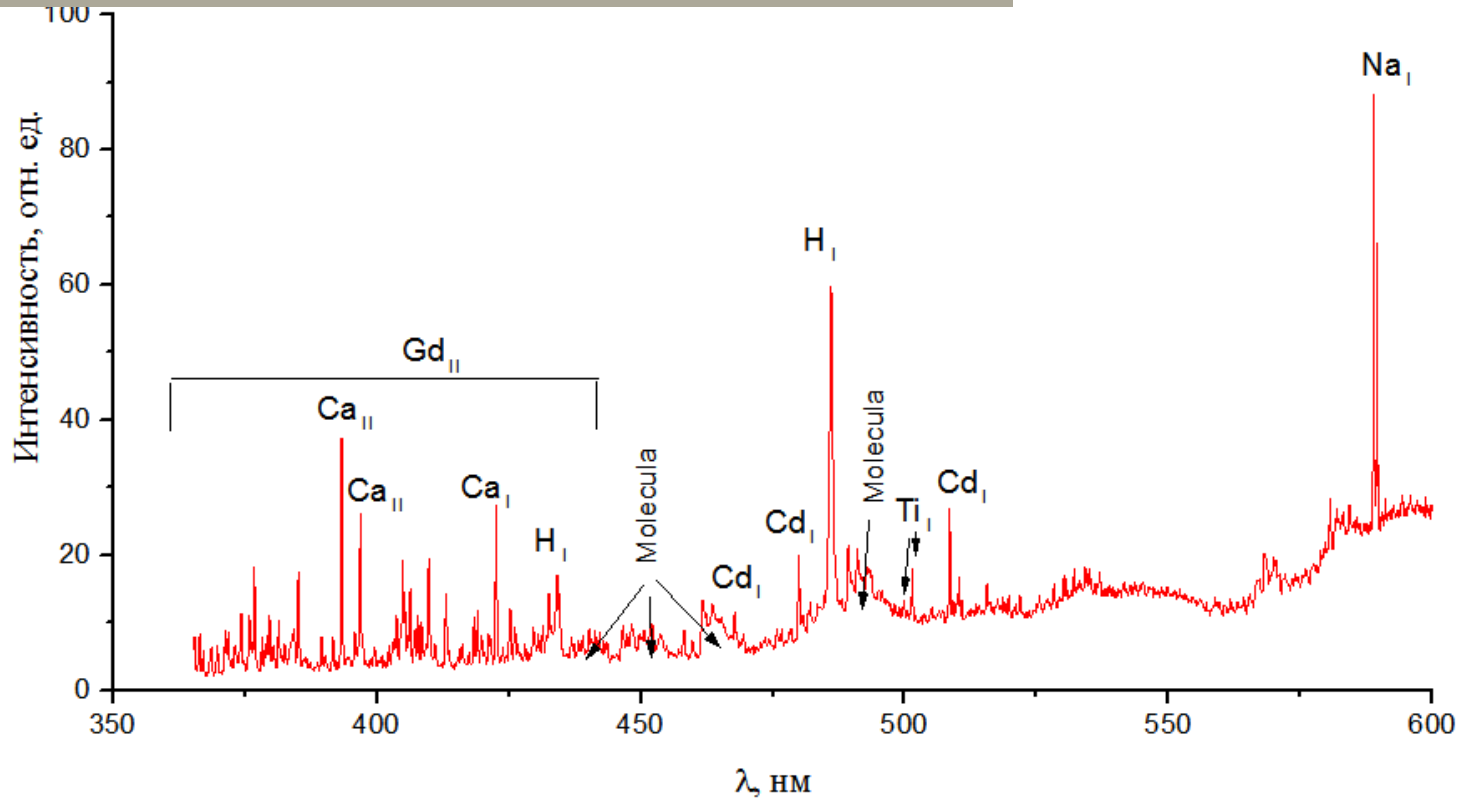
Summary results

Element	Weight %
Aluminum	4.9
Silicon	3.4
Manganese	4.4
Iron	28.2
Nickel	**59.1**

Exposed electrode
Tp~ 20c

Combined diagnostic method: - IMS + optical spectroscopy





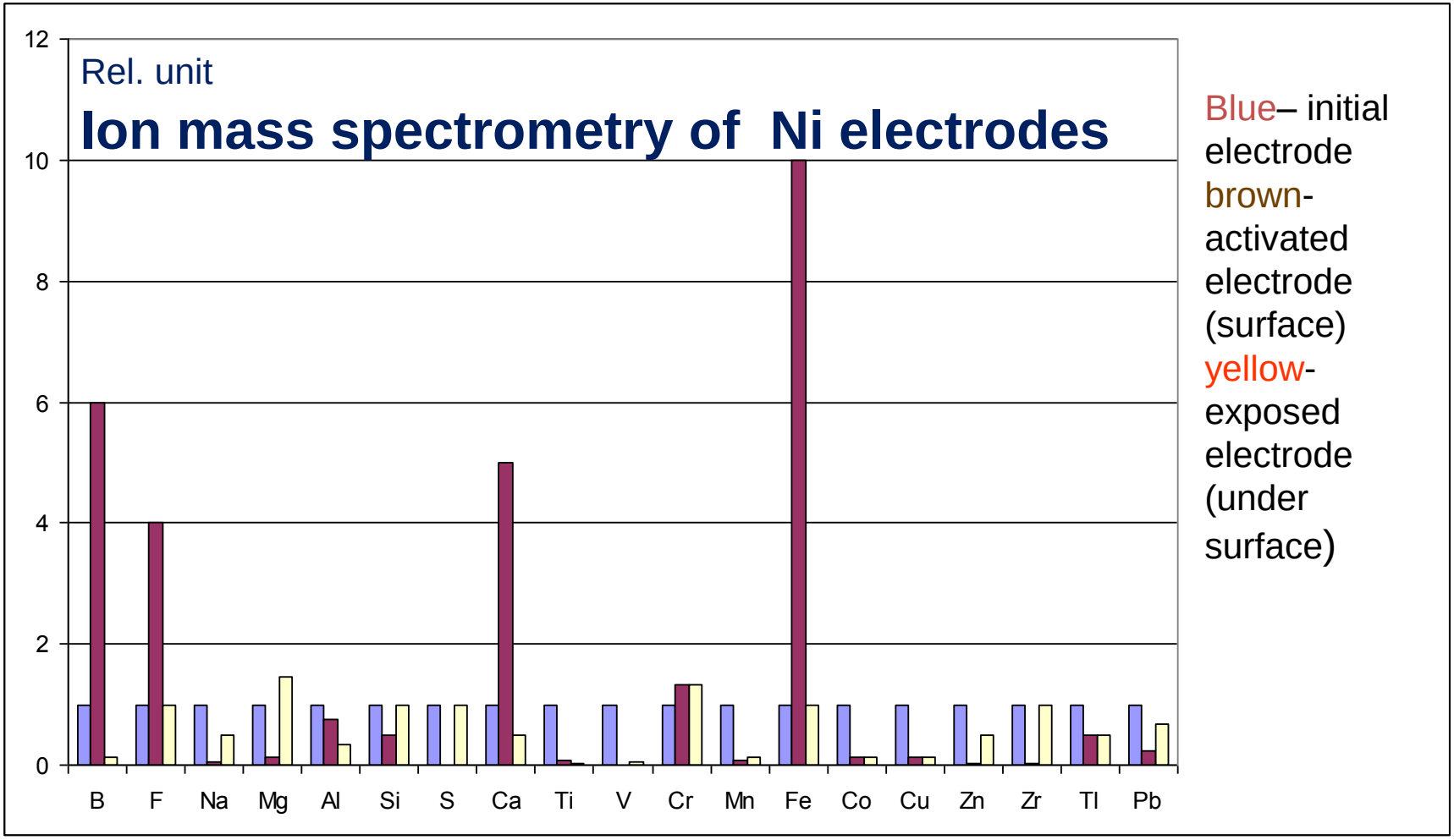


Table 1. *Dusty particle composition in PVR.*
Ion Mass spectroscopy analysis. Ni-electrodes 99,99%

	Si	Ni	Fe	C	Al	Cu	Co	K	Mg
Atom., %	50	14,7	8,9	8,8	6,2	5,1	1,8	1,3	0,4
Mol. %	31	19.2	10.9	2.3	4.7	7.2	2.4	1.1	0.2

Spectrometers *X-123SDD (USA)* and *BDER (Russia*) record soft X radiation (0.1-30 keV) in heterogeneous plasmoid. X-receiver is arranged at different cross sections of PVR testing section and cross sections behind nozzle at L=1÷100 cm from it.

Main results

1. Heterogeneous plasmoid behind PVR nozzle creates soft X-ray radiation in the range δE~100÷10000eV. X-radiation decrement is very small. Radiation intensity decrease is about 20% at L=100cm.

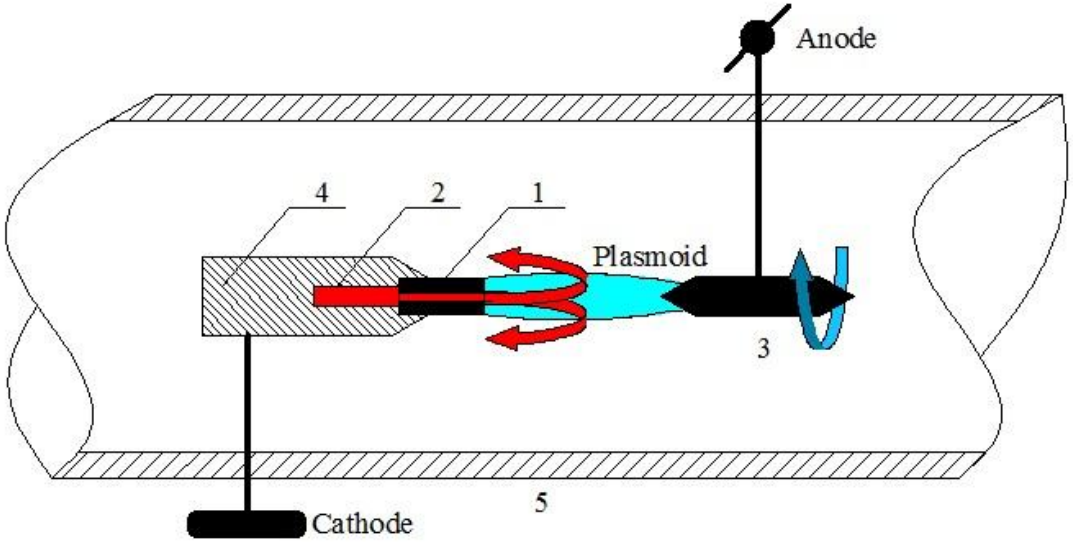
2. The main pike E_1= *1.3 keV* in X-spectrum is closed to quantum energy of $K_{\alpha 1}$ aluminum line E_{Al}=1.487 keV and $K_{\alpha 1}$ magnesium lineE_{Mg} =1.254 keV.

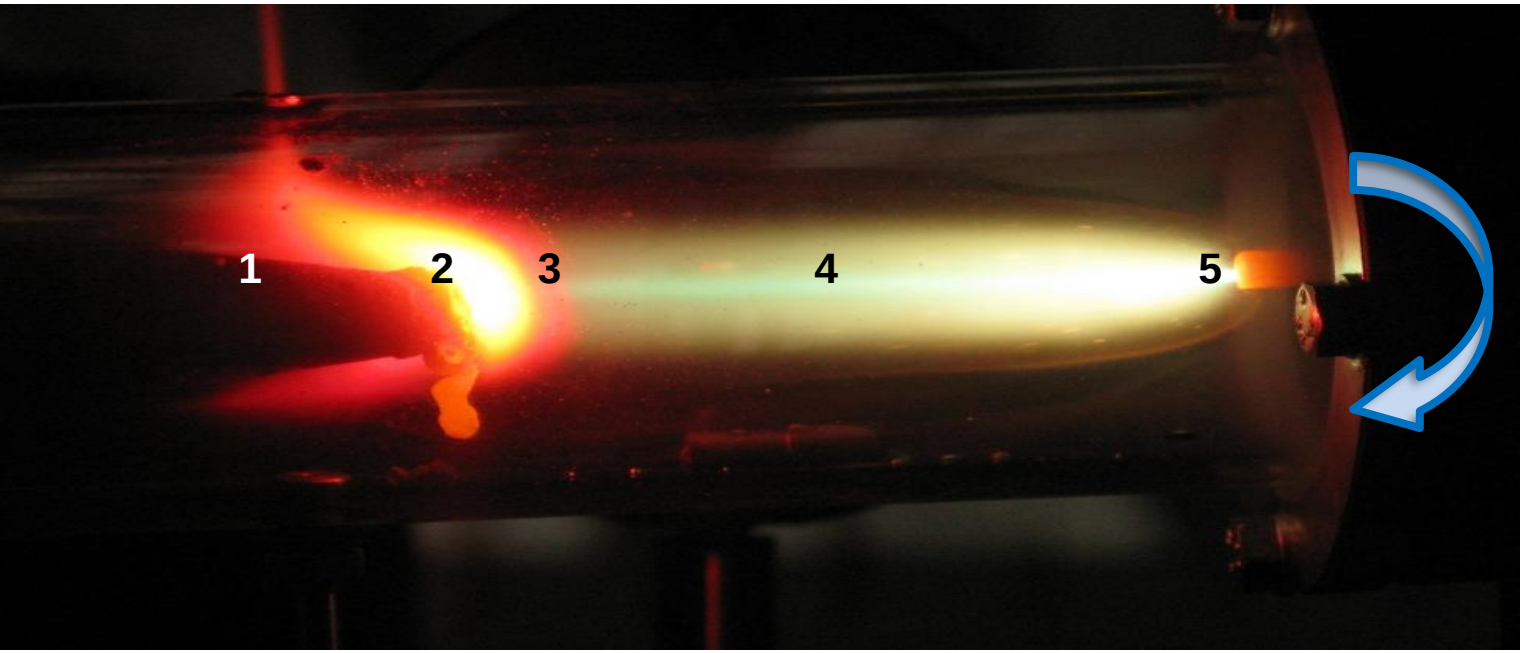
3. Additional pikes are located at range up to 10 keV. The peak *E2*= *4÷4.6 keV* corresponds *to sum of resonant Ti, V, Cr lines*
4. It is revealed that there is chemical elements evolution at value L increase behind nozzle. The *unusual* fluorine $K_{\alpha 1}$ line E_F=0.68 keV is recorded in heterogeneous plasmoid.

4. It is revealed that maximal value of *COP* is realized at *maximal X-radiation* from plasmoid namely

Part 5

HOT ELECTRONS AND HOT EXCITED ATOMS IN PLASMOID

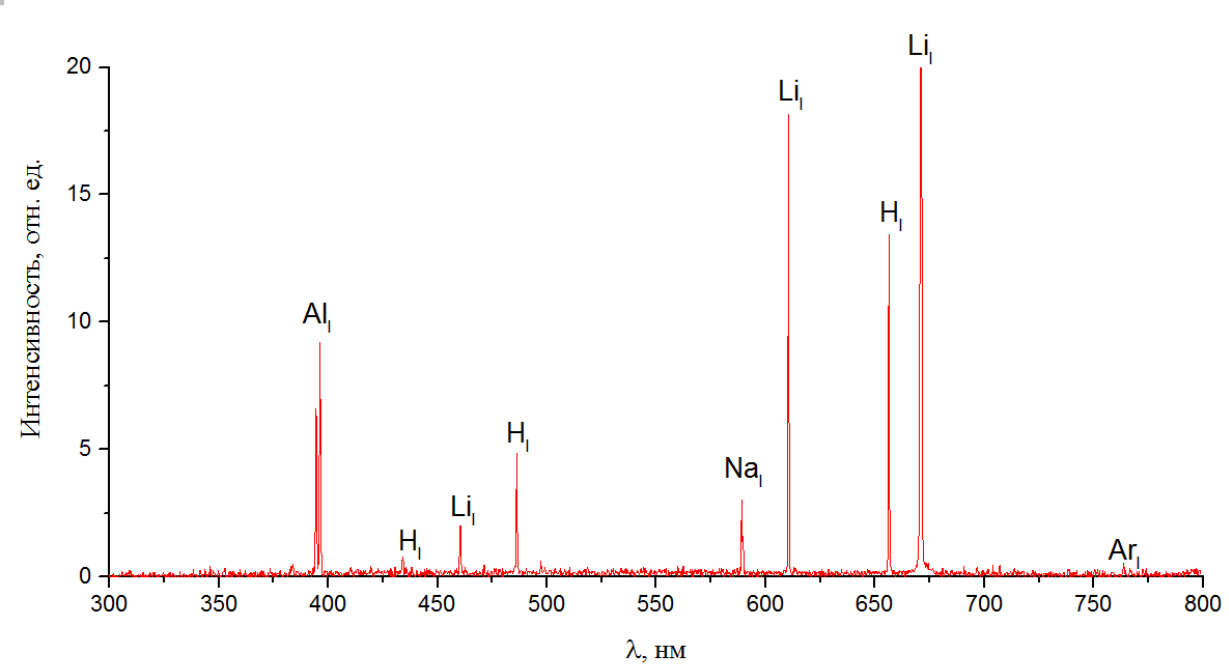


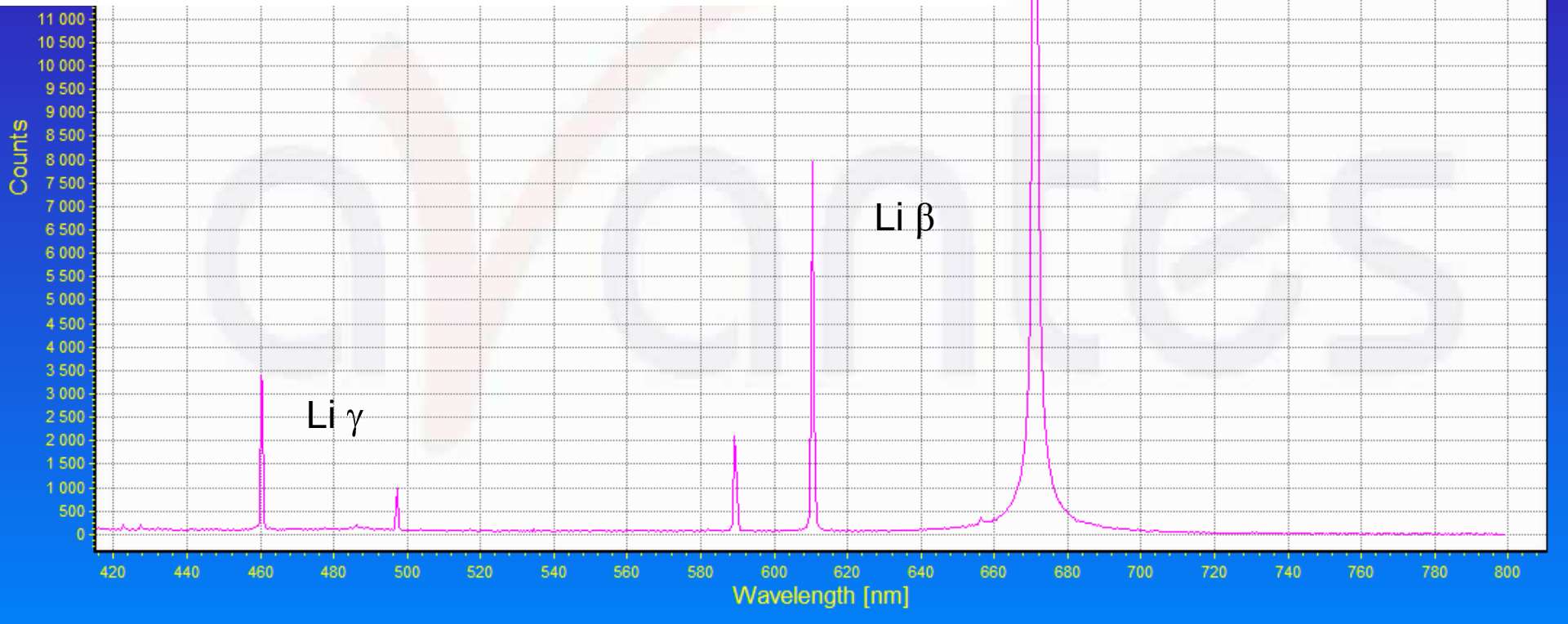


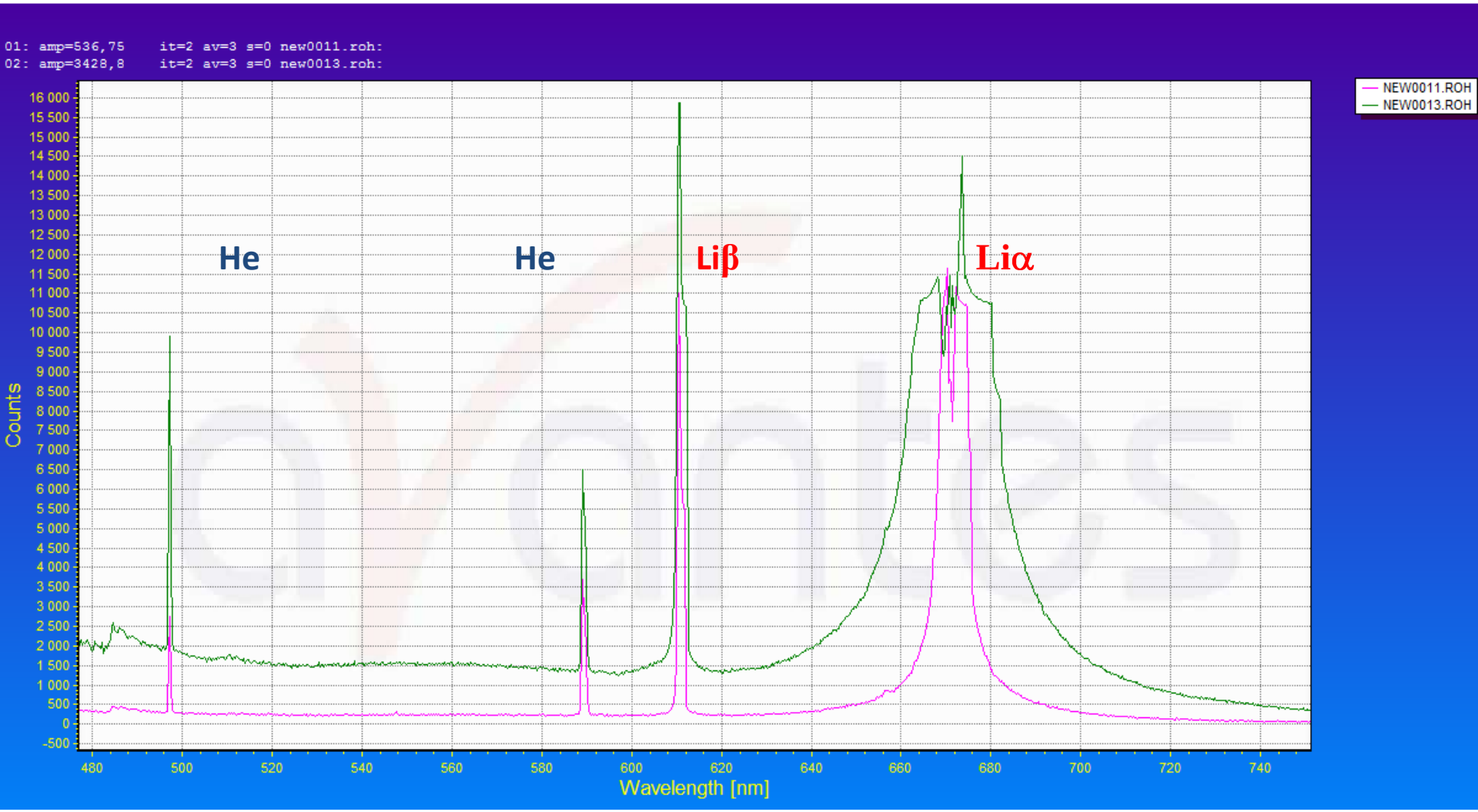
Heterogeneous Plasmoid in Swirl Flow.

1- cathode with Li-injector, 2,3 – **Li**- plasmoid, 4- **H**- plasmoid, 5-anode

Considerable broadening of the optical line **Li α**






01: amp=536,75 it=2 av=3 s=0 new0011.roh:
02: amp=3428,8 it=2 av=3 s=0 new0013.roh:
NEW0011.ROH
NEW0013.ROH
He
He
Liβ
Liα
Counts
Wavelength [nm]
16 000
15 500
15 000
14 500
14 000
13 500
13 000
12 500
12 000
11 500
11 000
10 500
10 000
9 500
9 000
8 500
8 000
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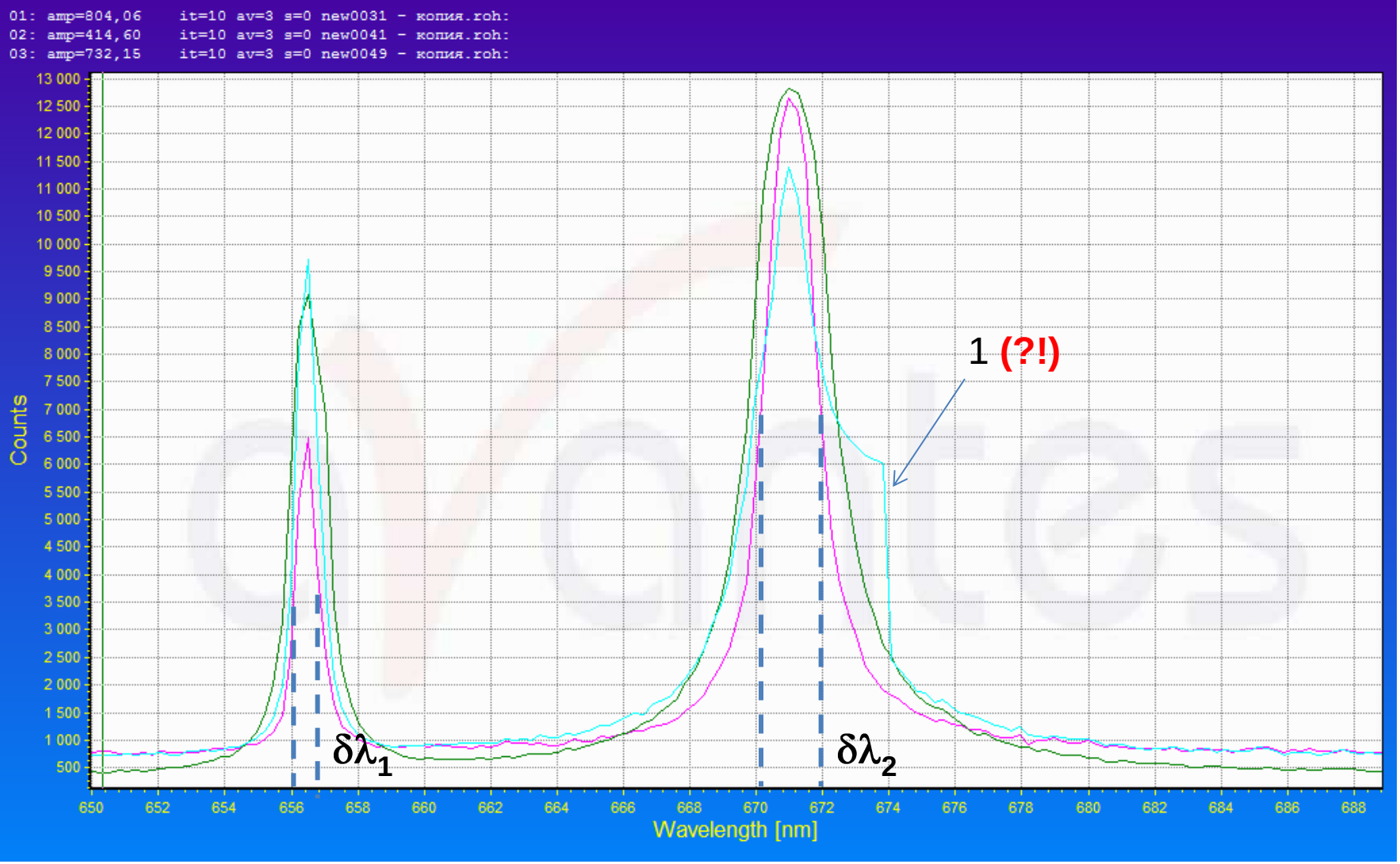
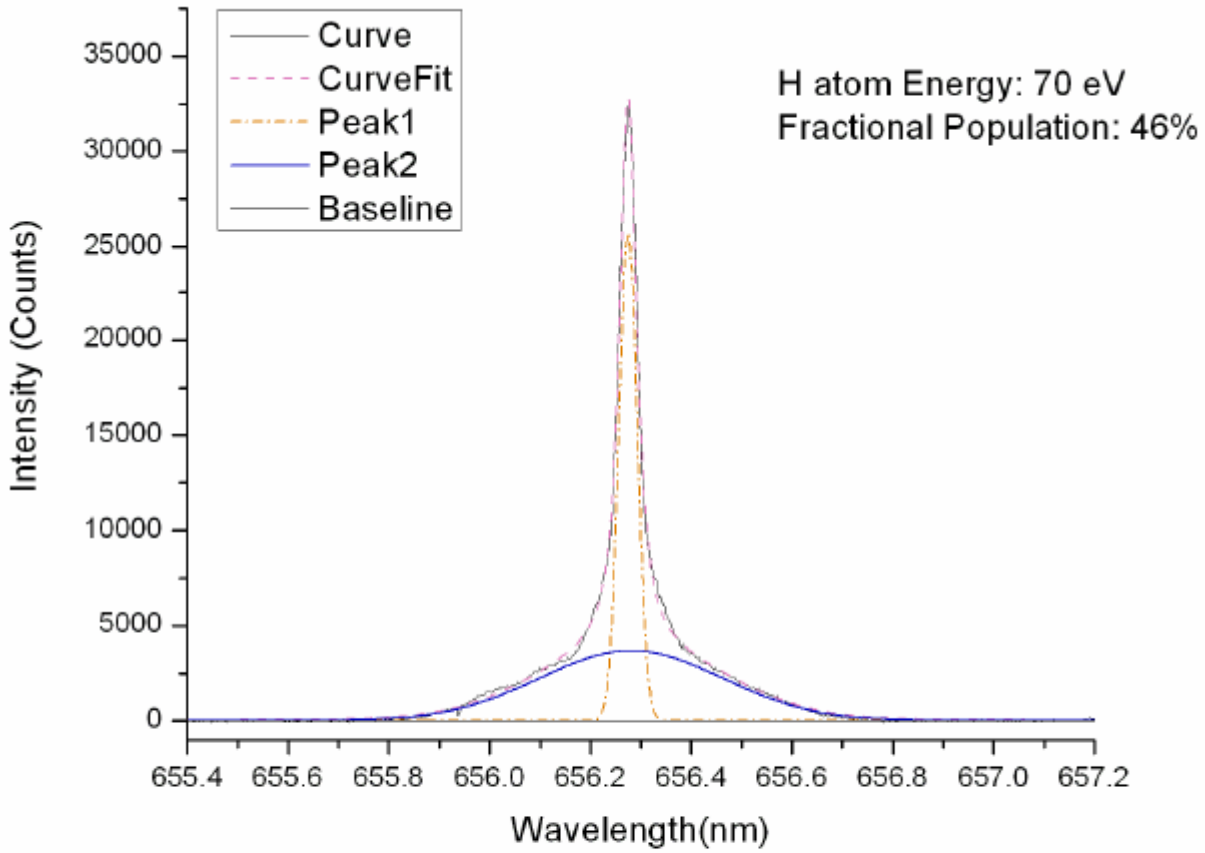
720
740



Unusial optical line *Li* α profile in heterogeneous plasmoid. *Testing Mixture He-H_2O-H_2 + small Li injection*

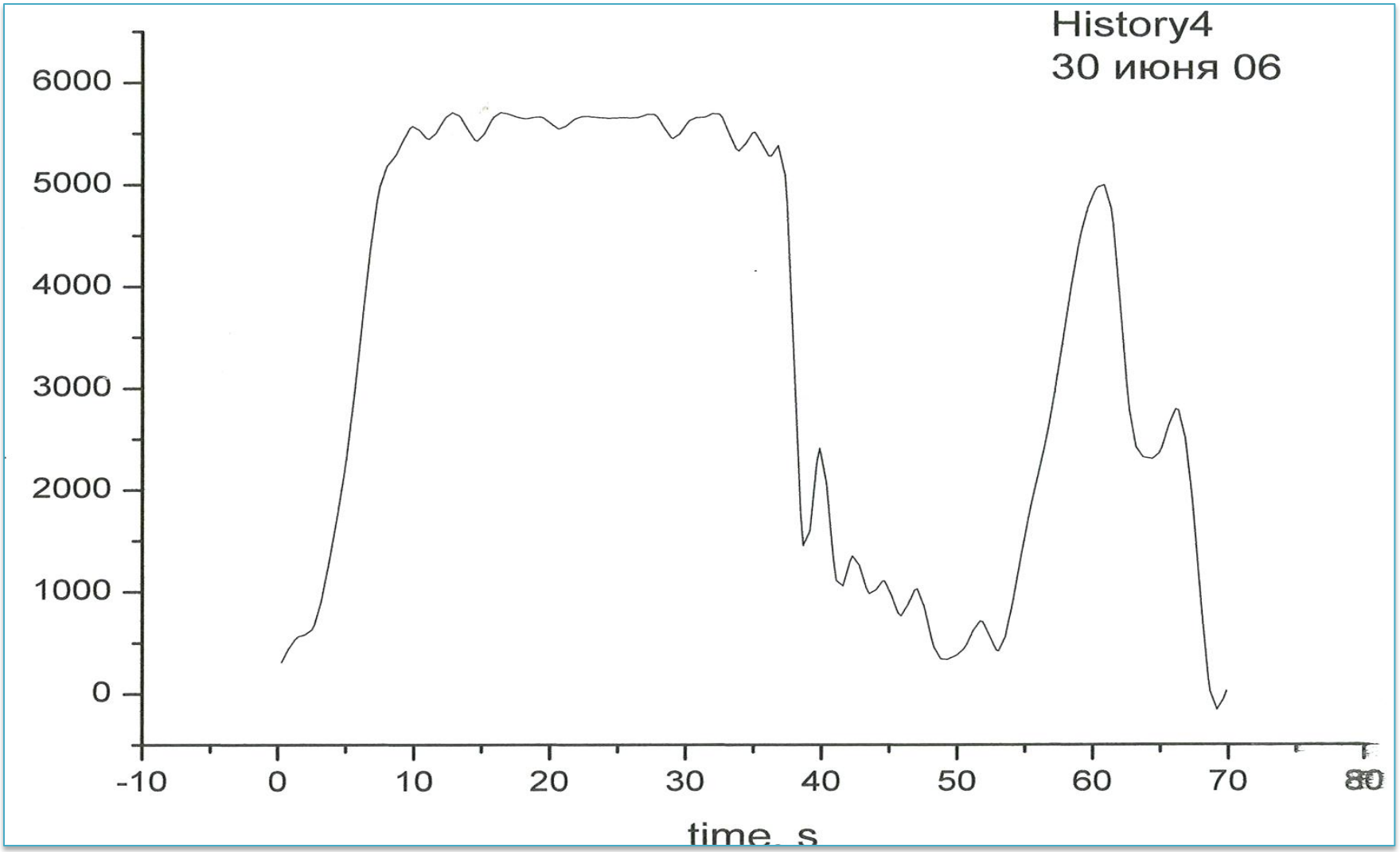
$\delta\lambda_2 / \delta\lambda_1 > 3$ $T_e > 100eV$



Excessive hydrogen line broadening in H_2 discharge corresponding to fast H atom with energies of 60-70 eV.

*R.Mills. Tech.Pres. 8.05.11

Optical Spectroscopy. Li-line λ=670nm



Discussions and Conclusions_1

- **Binuclear Atom.** Registration of intensive soft X-ray radiation E<10KeV) in heterogeneous plasmoid (hydrogen atoms, ions + metal nano-clusters) and chemical analysis proves that there is interaction of *protons with internal electrons* inside metal atom and creation “new chemical elements” (binuclear atoms)
- **Hydrino.** Note that second maximum in X- spectra (E_2~4KeV) is closed to the value Compton Energy $E_C \sim M_e C^2/137 \sim$ 3,73KeV. So, hypothesis about *hydrino* with small radius closed to $R_C \sim h/M_e C$ and the same energy $E_h \sim E_C$ may be used to clear of these experimental results
- **COP and X-ray radiation**. It is revealed that maximal intensity of soft X-ray radiation correlates with maximal COP in PVR
- **COP and [$N_{cluster}$], [N_H].** Maximal COP is measured at maximal concentrations of metal nano-clusters and hydrogen atoms in heterogeneous plasmoid in PVR

Discussions and Conclusions_2

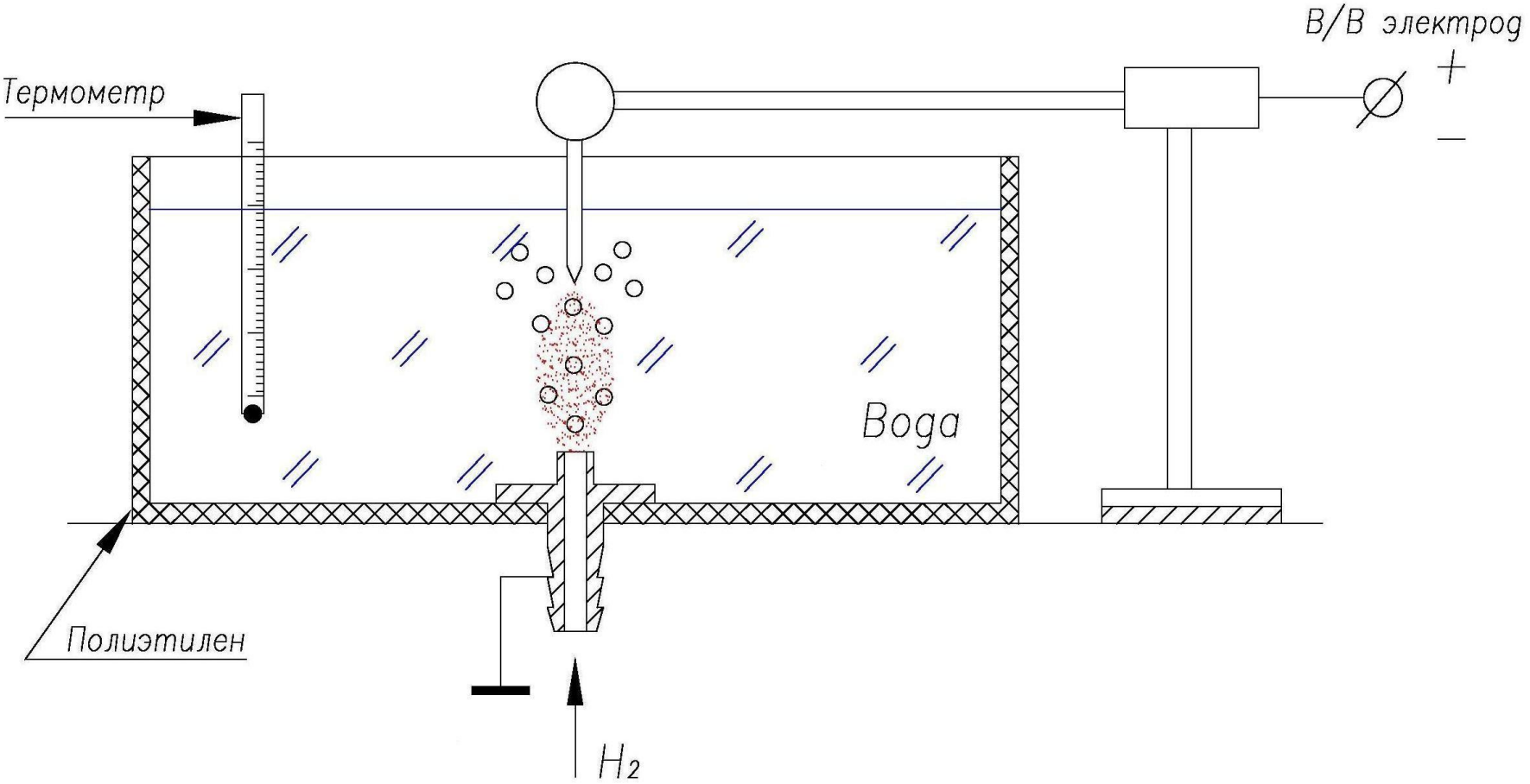
- **High excited "new atoms" and high energy reactions**. There are optical lines of new high excited atoms are recorded in heterogeneous plasmoid such as CuII (E*~ 36,8eV), ZnII (E*~ 18eV), CaII, LiI and others. There is high electronic temperature of excited atom Li* Te~100eV in heterogeneous plasmoid.
- **High specific heat power** of "nano-cluster fuel"

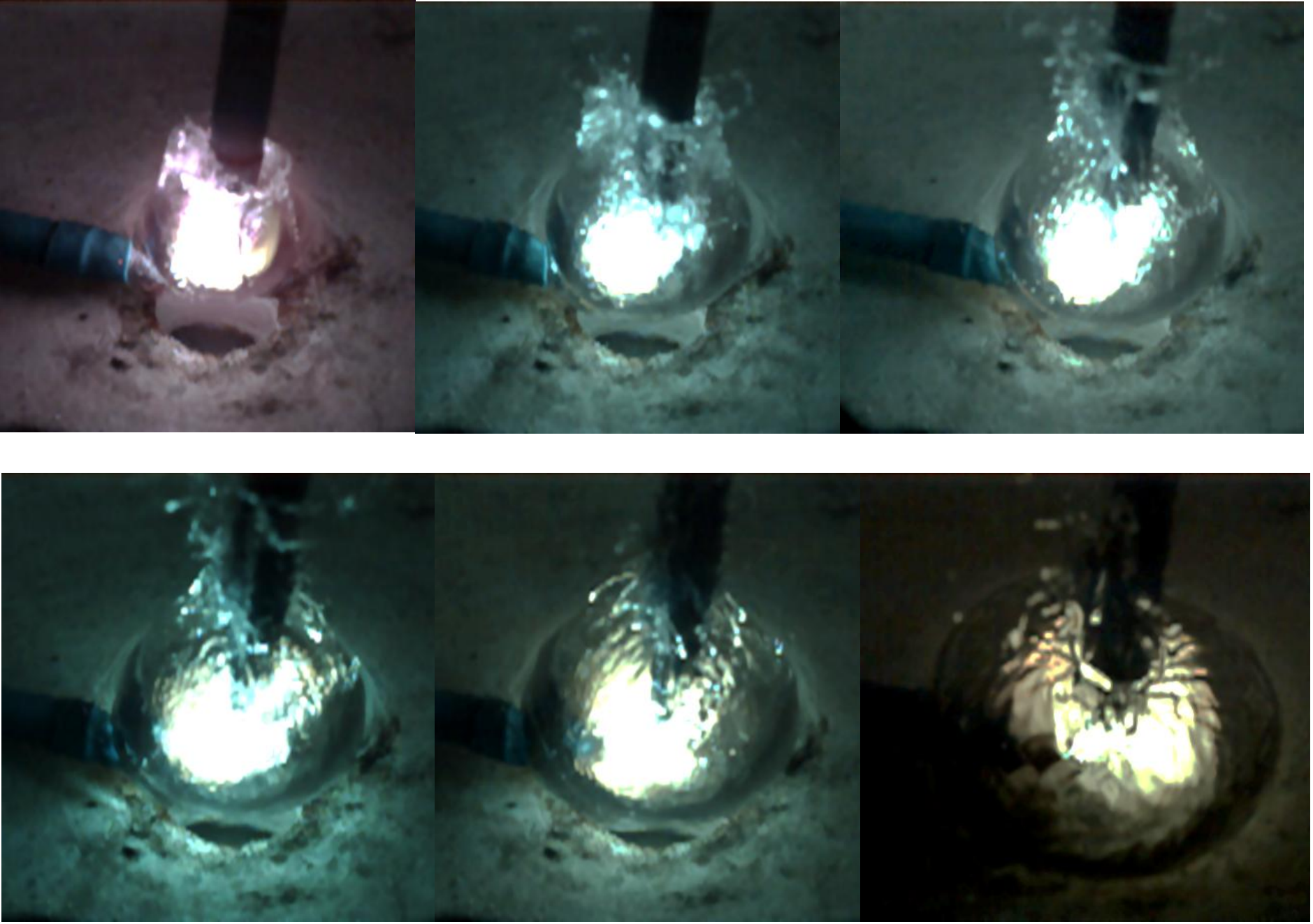
$$Q = \delta P / \delta N = 10^3 \text{ eV/atom}$$

Thank you for attention !!!!

Water Plasmod Reactor (WPR) with Gas Bubbles

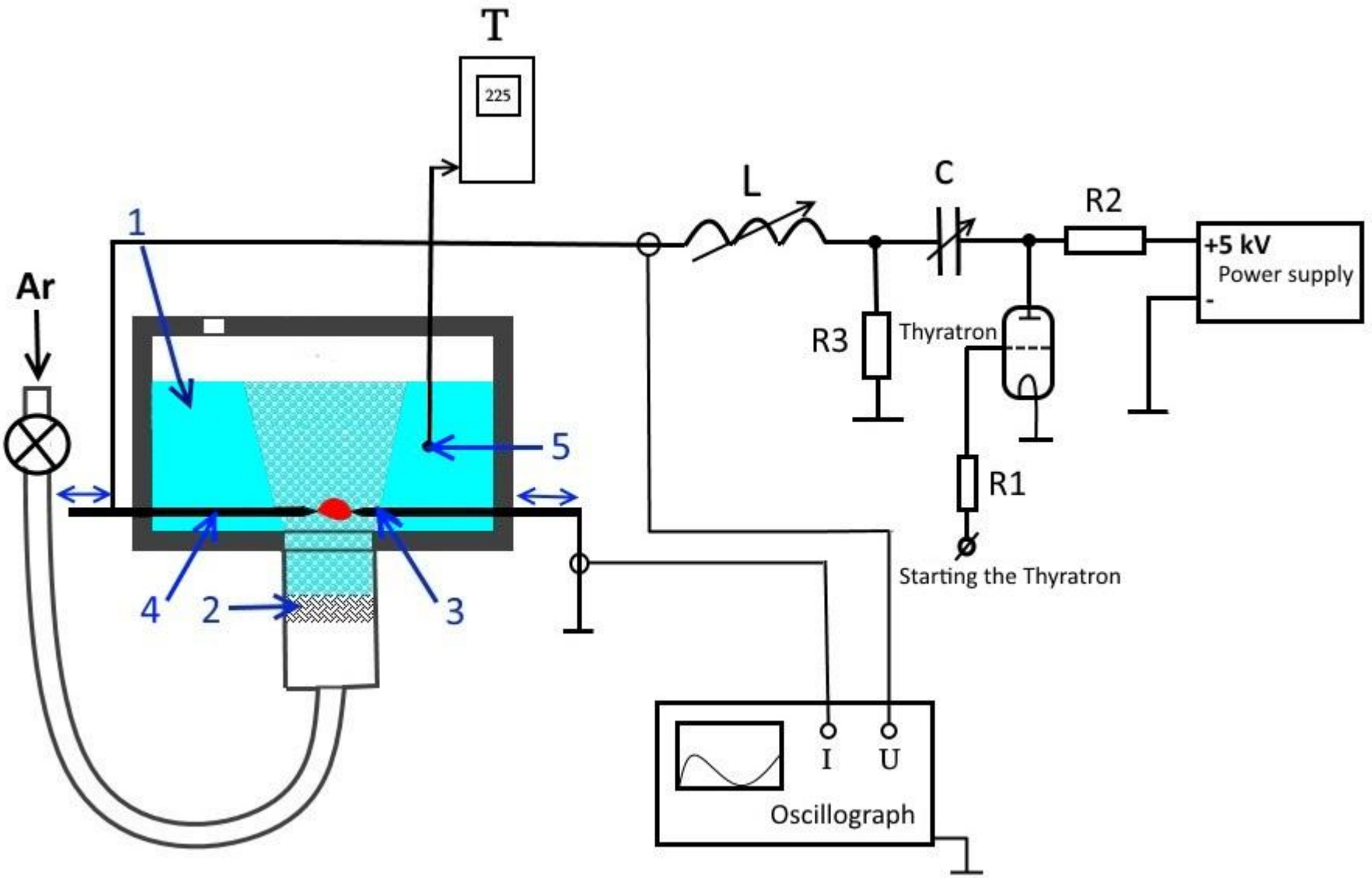
COP~2



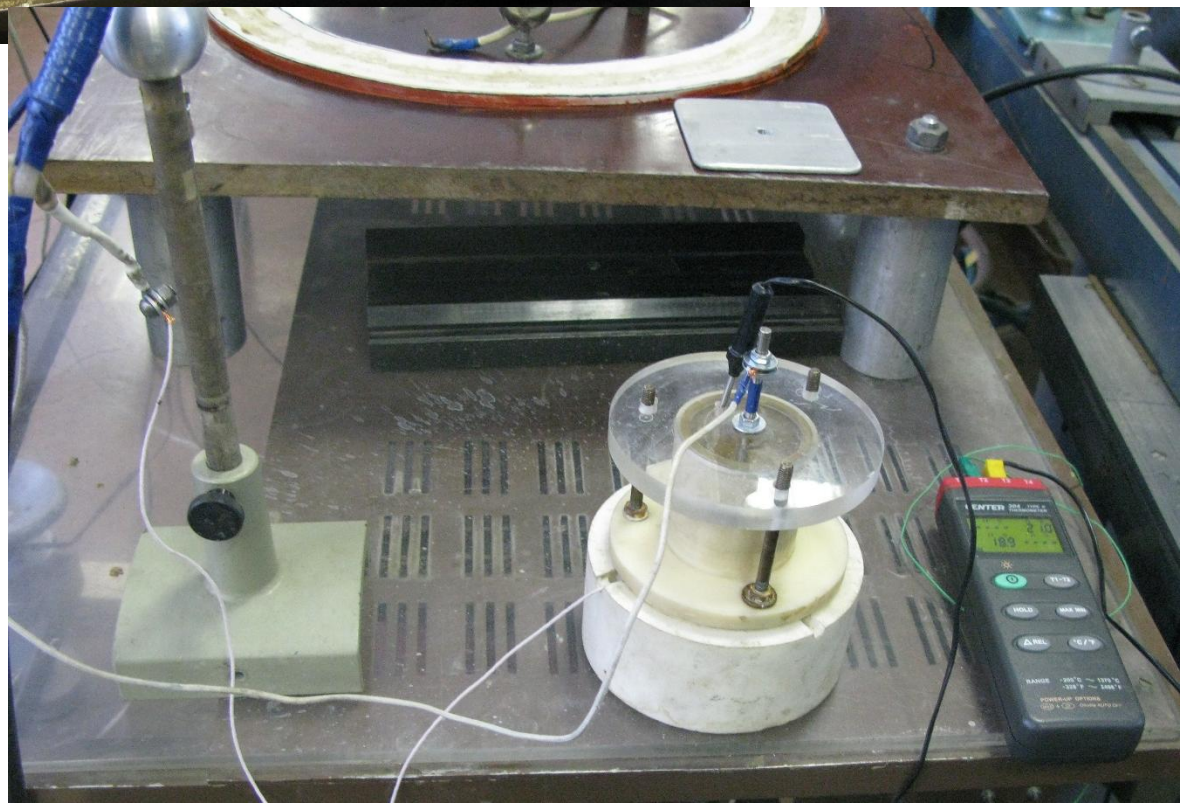


Plasmoid inside argon bubble

Scheme of experimental set up WPR

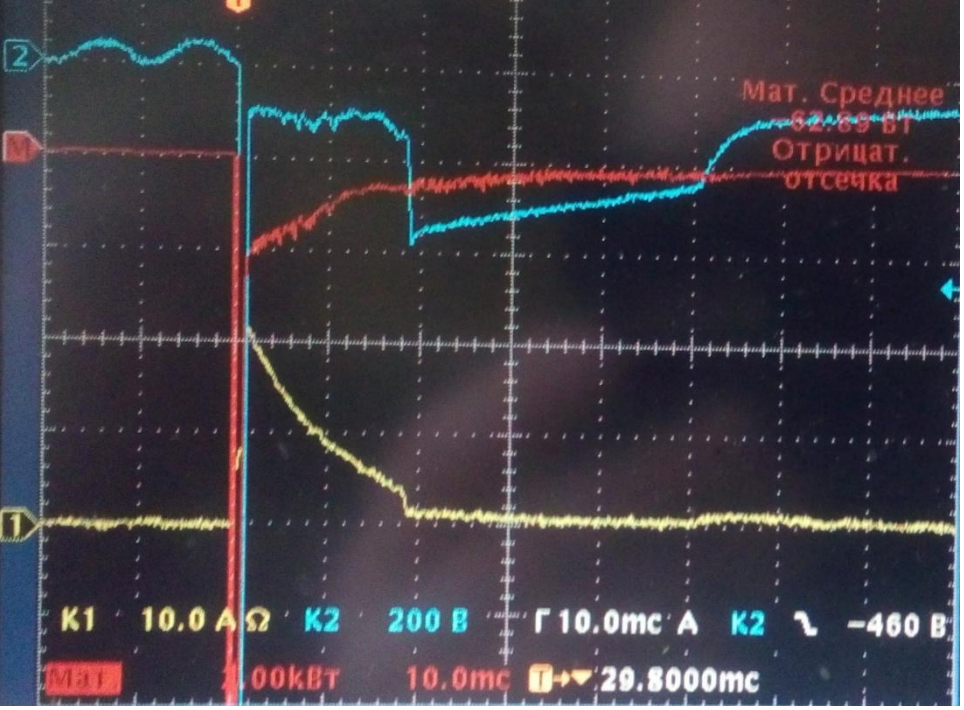


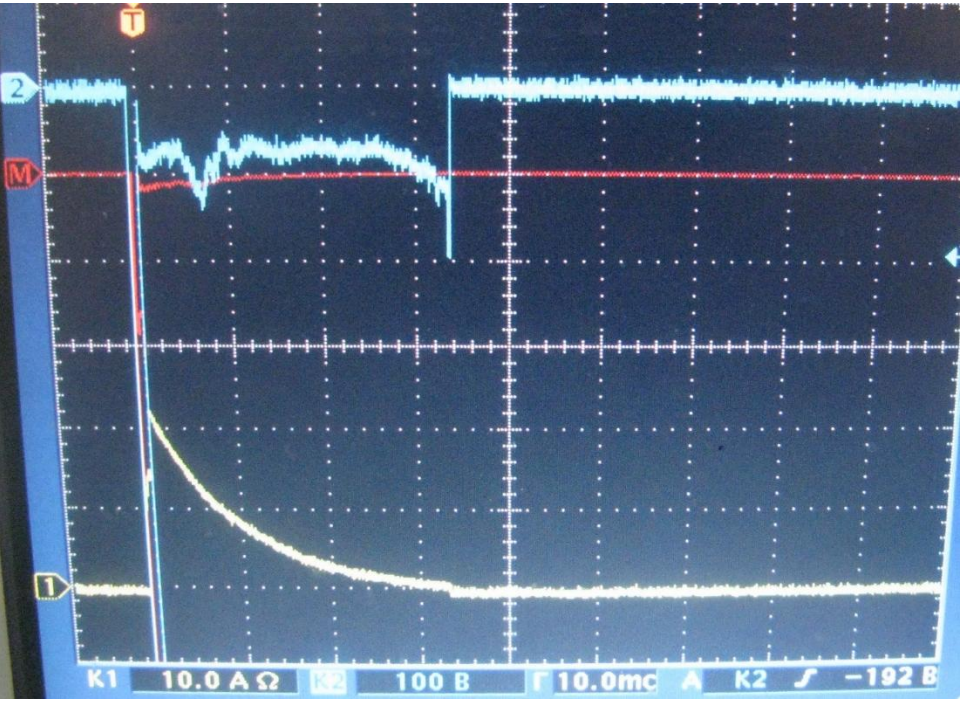
1-LiOH, 2-ceramic diaphragm, 3-anode, 4-cathode, 5-thermocauple



Reactor WPR-1

Reactor WPR-1





Reactor WPR-1

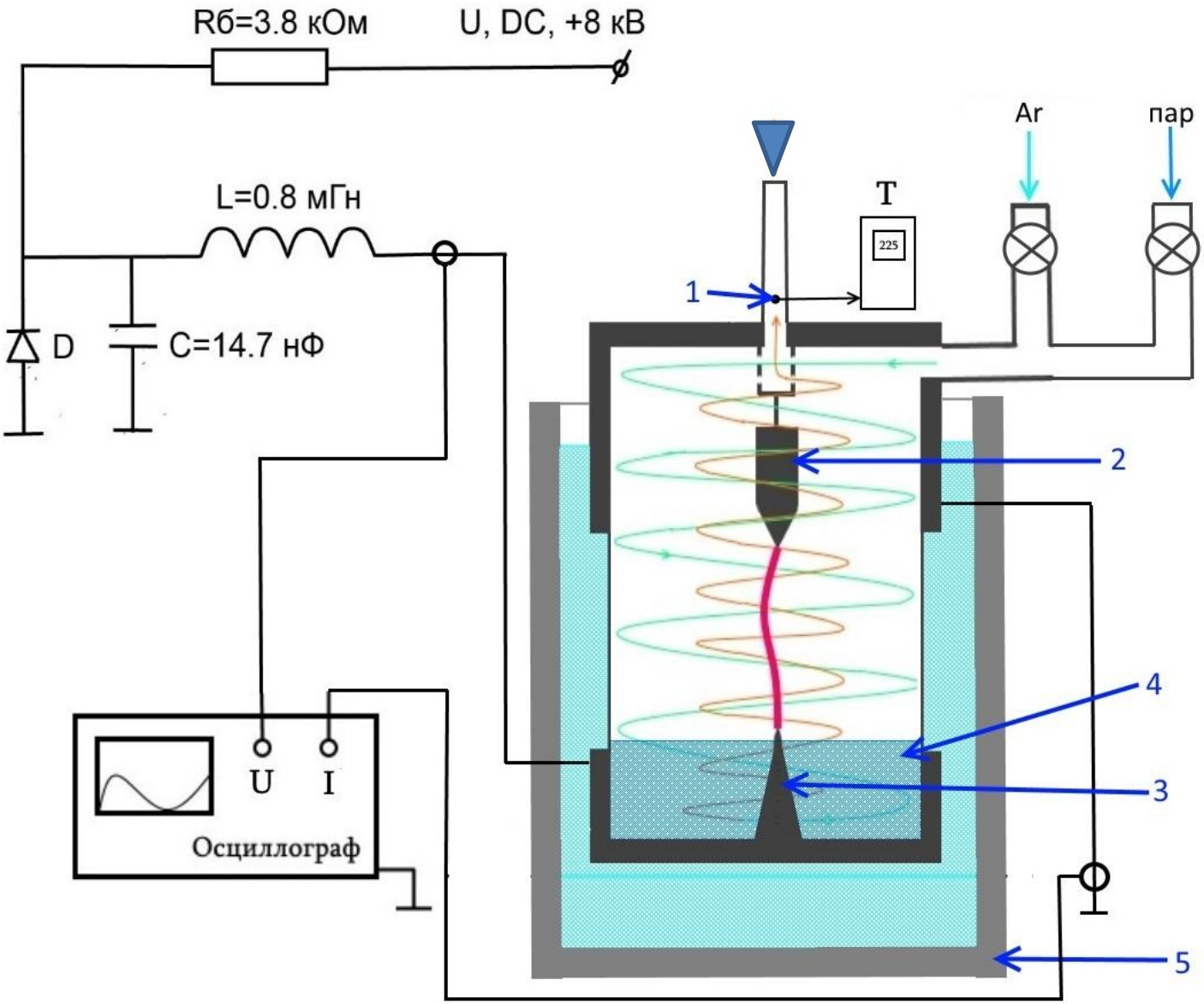
Signals

- Voltage (blue)
- Current (yellow)
- Power (red)

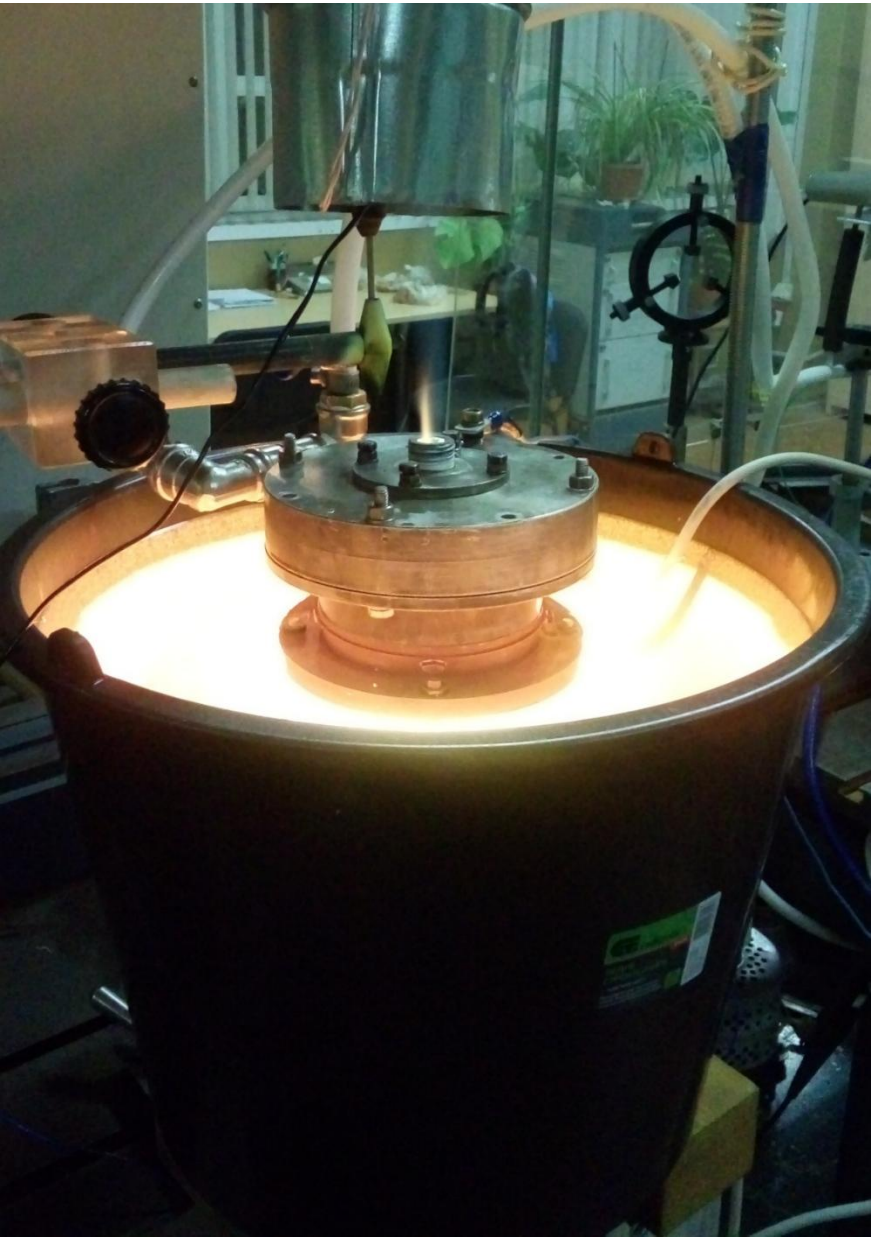
Pulse dureation- 21.6 ms
Eт=36.2 J
Ee= 17.3 J

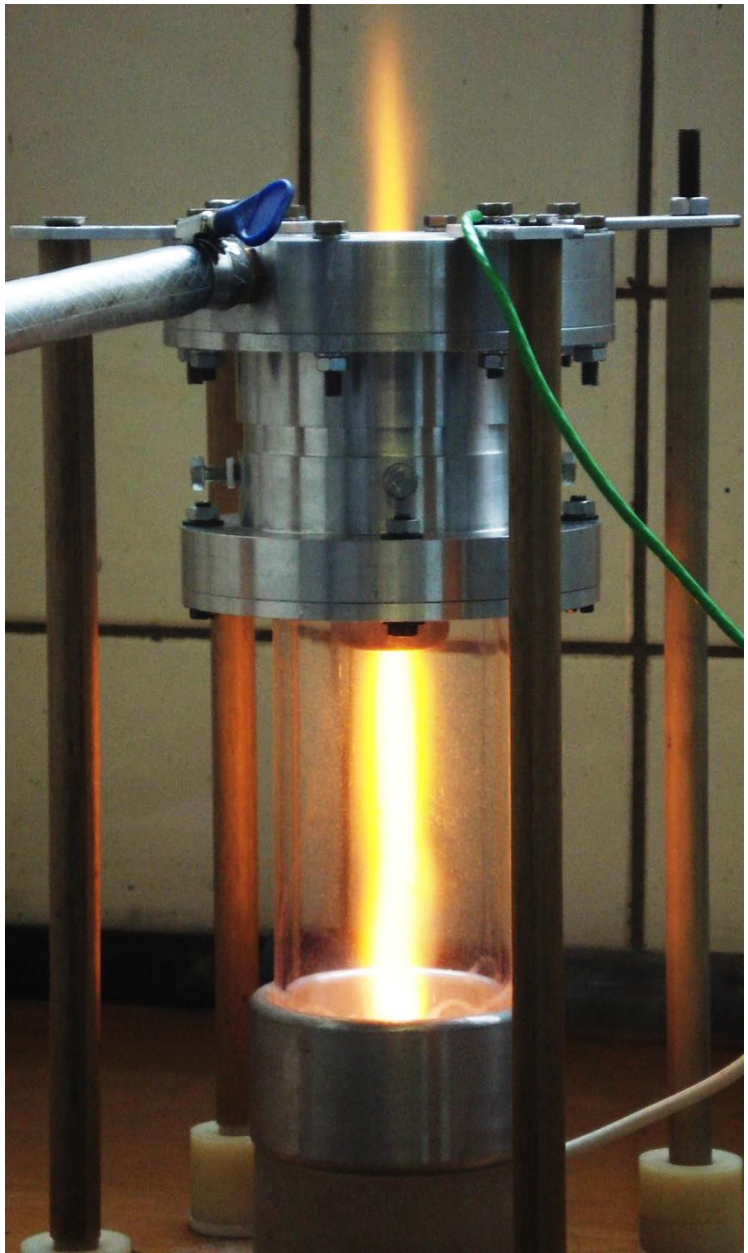
K= ***COP***= Eт/ Ee= **2.1**

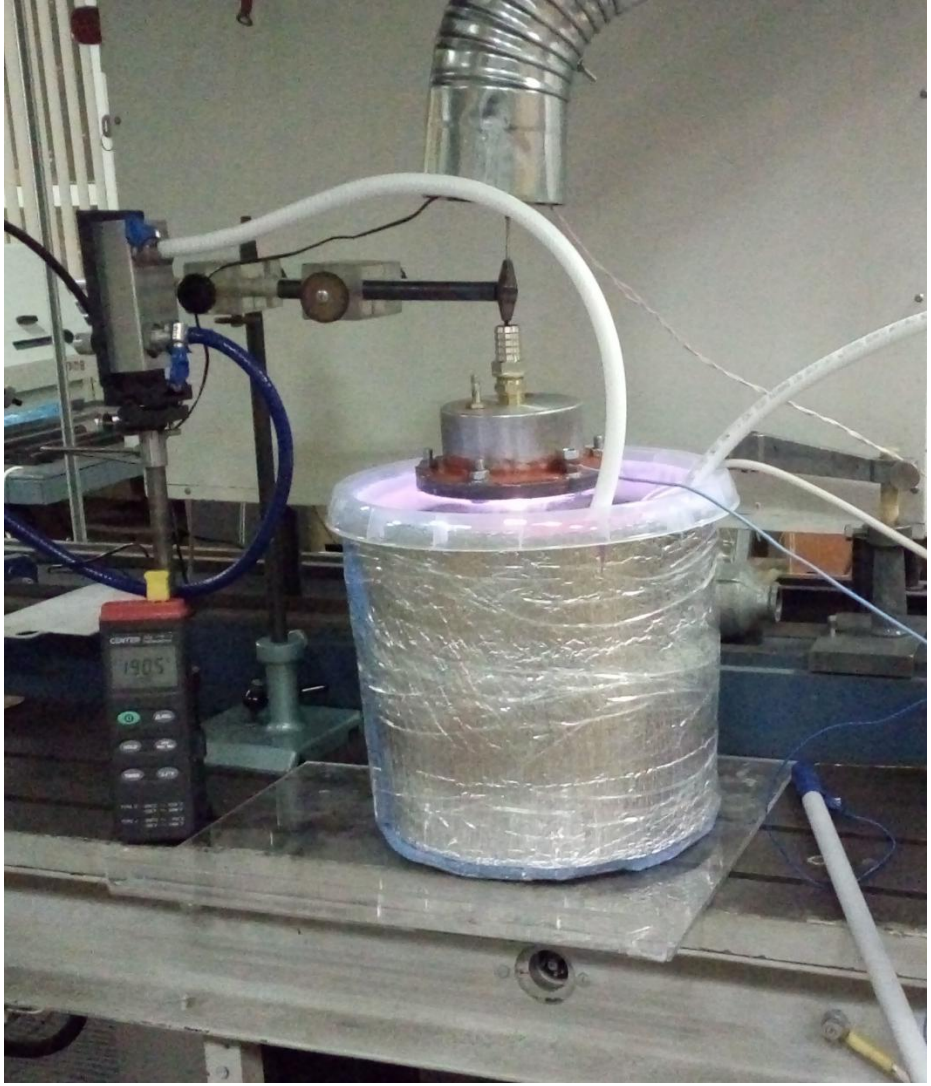
Reverse vortex reactor PVR-4 with operation gas mixture: water steam +argon



Our Main Result!!! Powerful Reverse Plasmoid Vortex Reactor. Testing gas –water steam. *Tп~ 5000C* *Ne~10kW*






1905

ISSN 1063-7842, Technical Physics, 2009, Vol. 54, No. 2, pp. 159–164.

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Saint Petersburg 194021, Russia

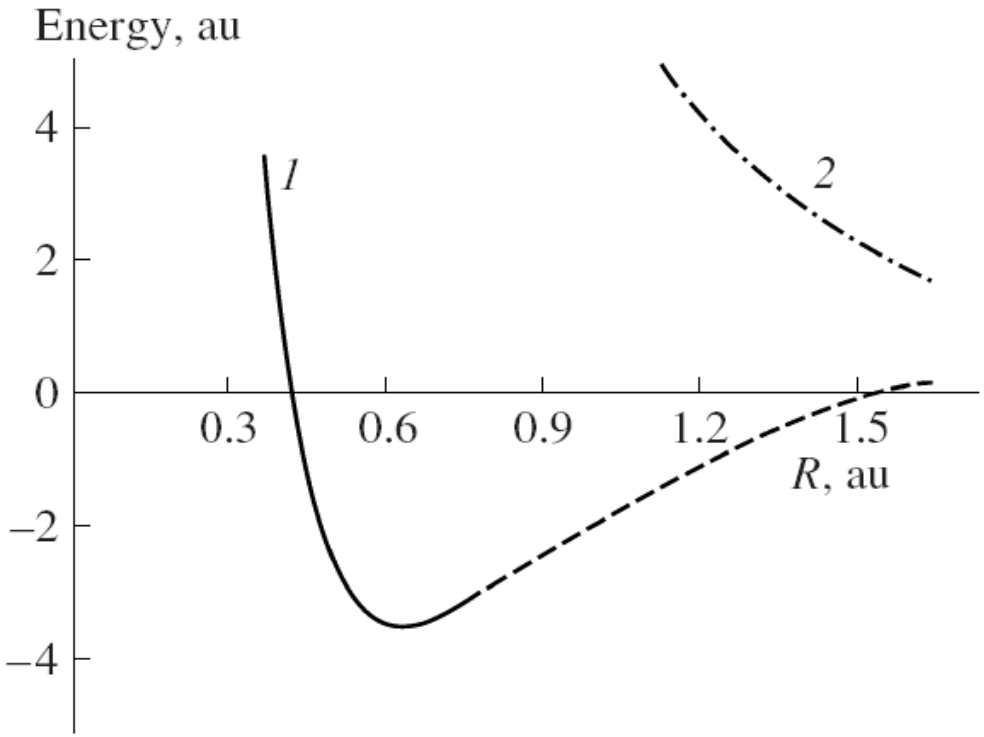
Binuclear Atom as the Bound State of a Proton and a Heavy Atom

V. P. Chalyi, V. L. Gurevich, and M. Yu. Pogorelsky

The existence of a bound state of a proton and a heavy atom is predicted.

The atom is described by the Thomas–Fermi method. The electrons screen the field of the proton, which suppresses the repulsive force between the proton and the atomic nucleus. On the other hand, the force of attraction between the proton and the electrons is directed along the electron density gradient (i.e., towards the nucleus). It is concluded that for Z= 80, the two forces are balanced at a distance from the nucleus of about ***0.6 of the Bohr radius***. It is found that the potential energy minimum of the proton with a depth of ***several tens of electron volts*** lies in the range of negative energies (attraction). It is proposed that such a system be referred to as a binuclear atom. It is emphasized that, in contrast to molecules, in which binding with the hydrogen atom is ensured by a rearrangement of the states of the outer-shell (valence) electrons, a binuclear atom is formed as a result of the collective response of the system of inner electrons to the proton potential.

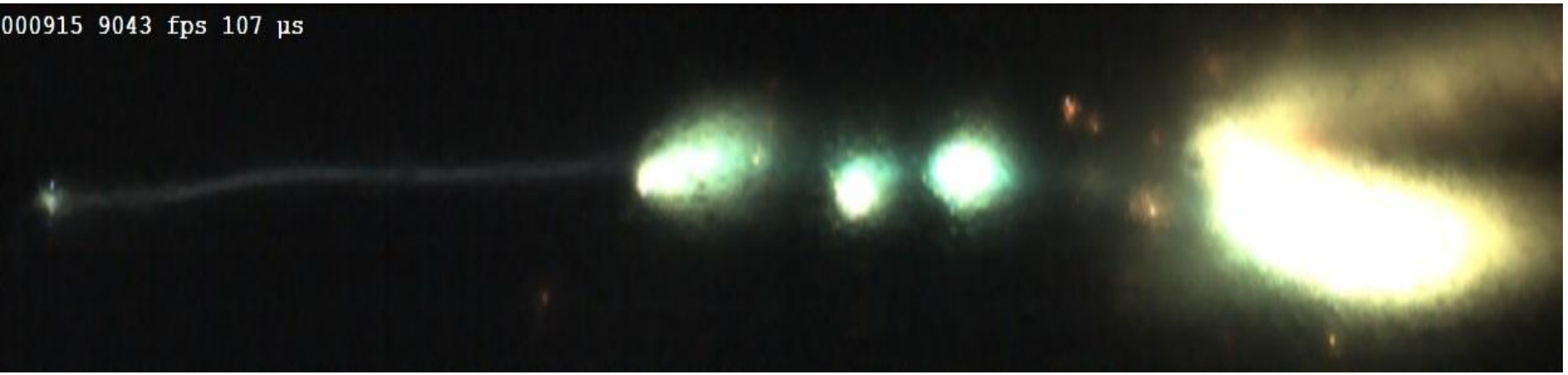
The distance between the nucleus and the bound proton (≈0.3 Å for $Z \approx 80$) *is much smaller than the* characteristic size of the wave functions of valence electrons. This means that the chemical behavior of such a system after adjoining an extra electron to neutralize it must resemble the behavior of an ***atom with atomic number Z + 1.***



Potential energy of the proton–heavy atom system as a function of distance: curve *1* describes the energy of the proton–heavy atom system ($Z = 80$) as a function of distance R between the proton and the nucleus; curve *2* is potential $\Phi(R)$. The dashed curve shows one of possible versions of a dependence intermediate between *1* and *2*.

Mark’s Plasmoid Generator.

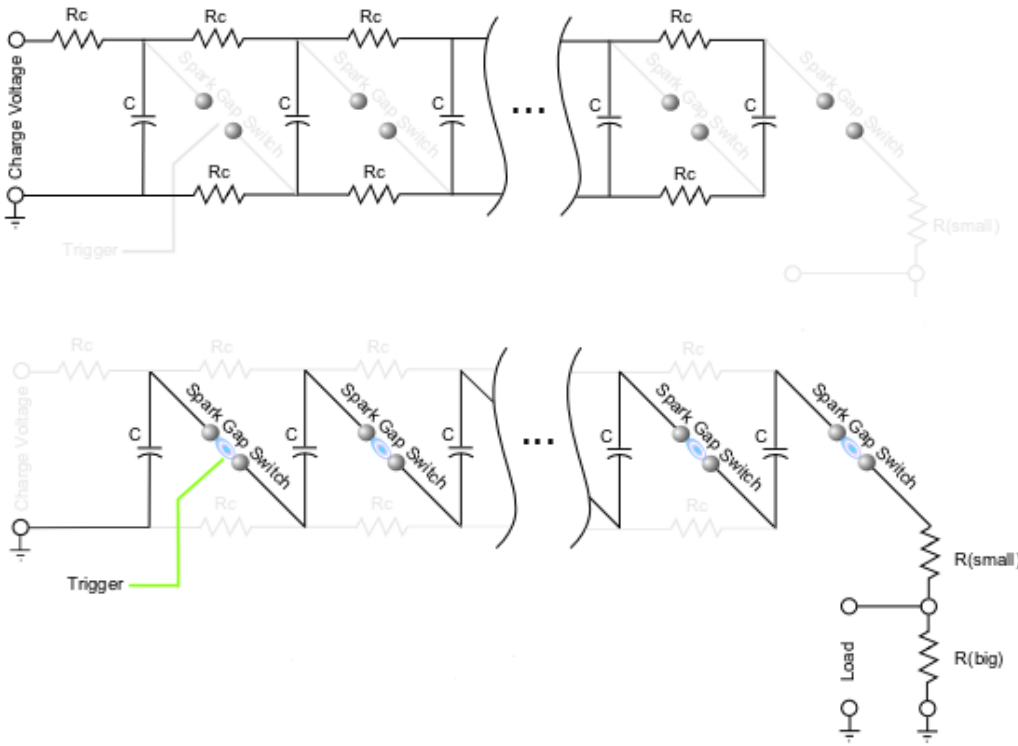
Operation Regime



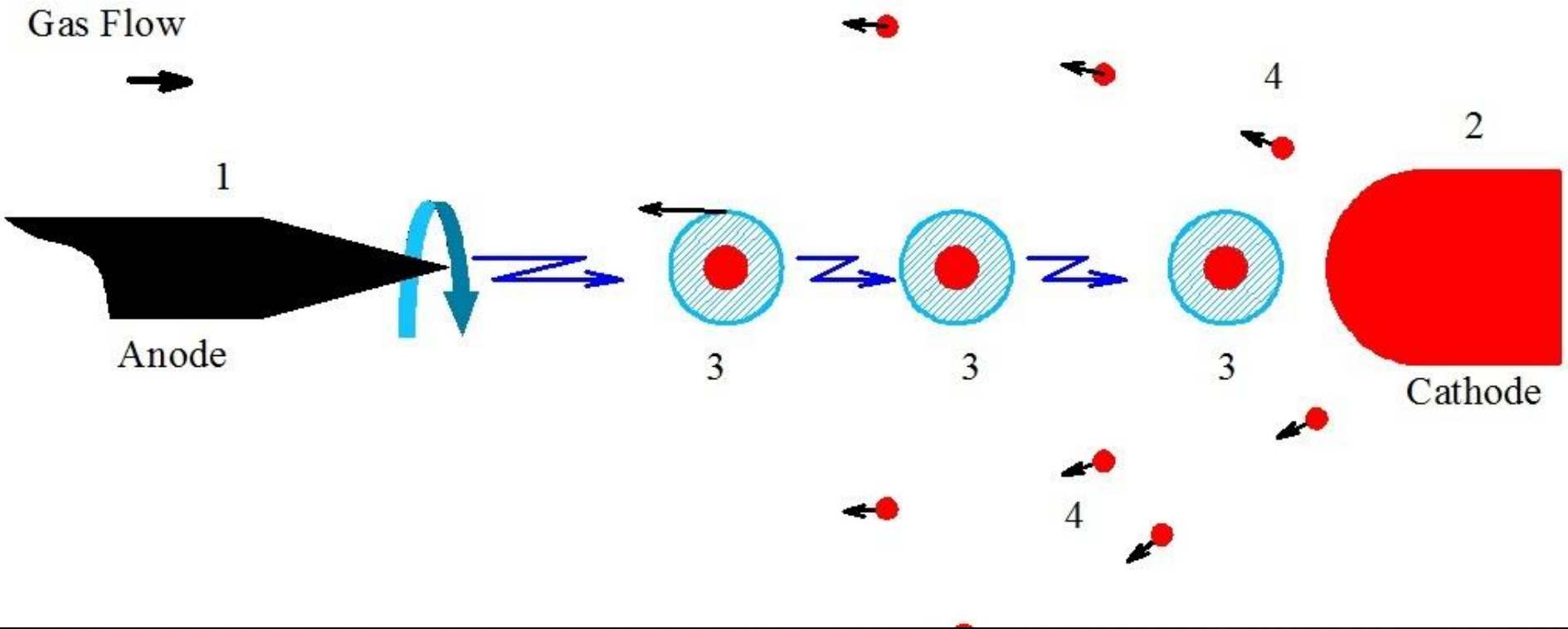
N (charged plasmoid ~0.1-1kV)=
U= N kV

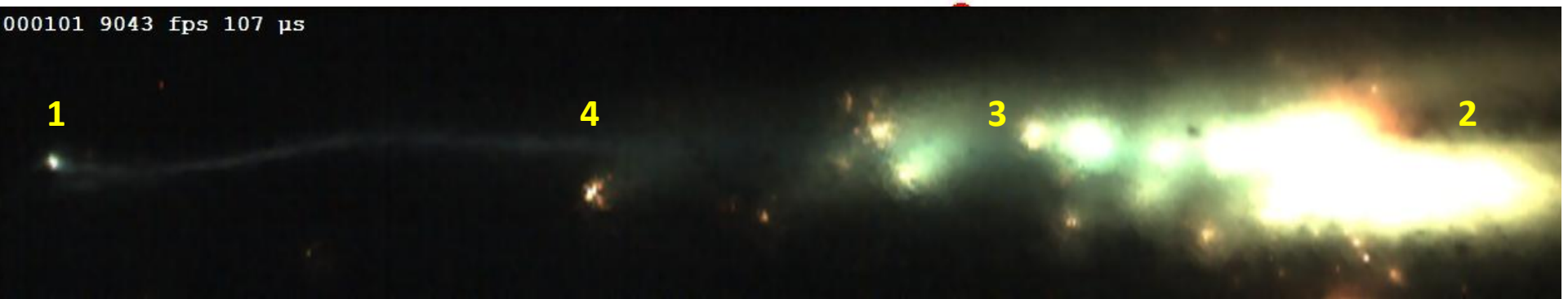
U= 1MV at N=1000

So, it is possible to obtain hydrogen ion with E~ 1KeV in the region of *streamer head* at N= 10



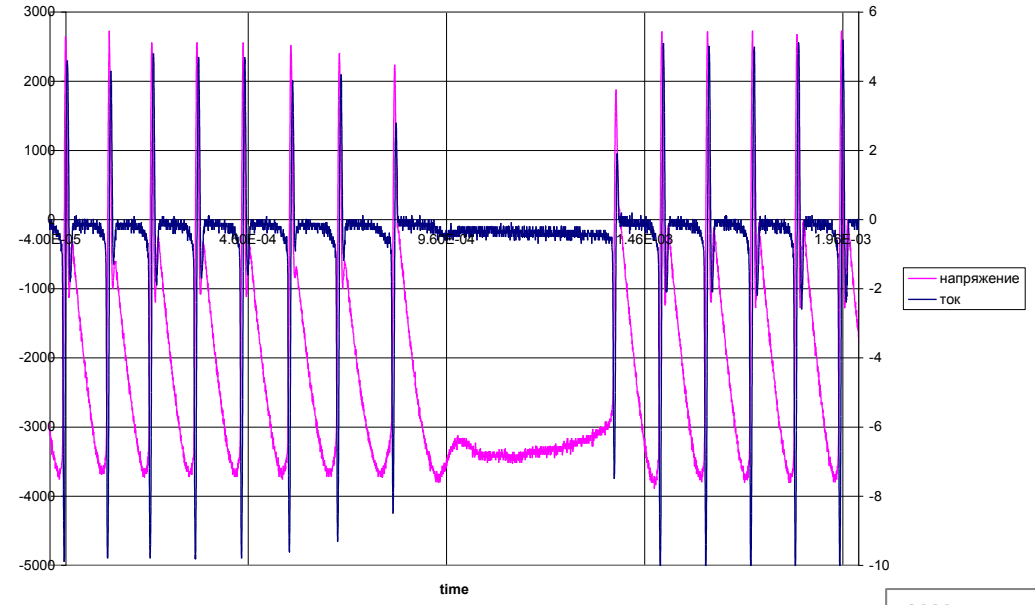
Principal scheme of Mark's Plasmoid Generator

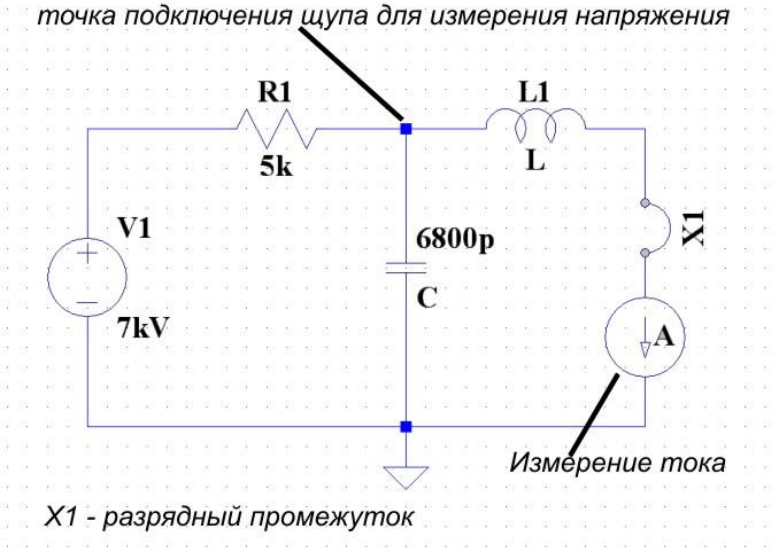


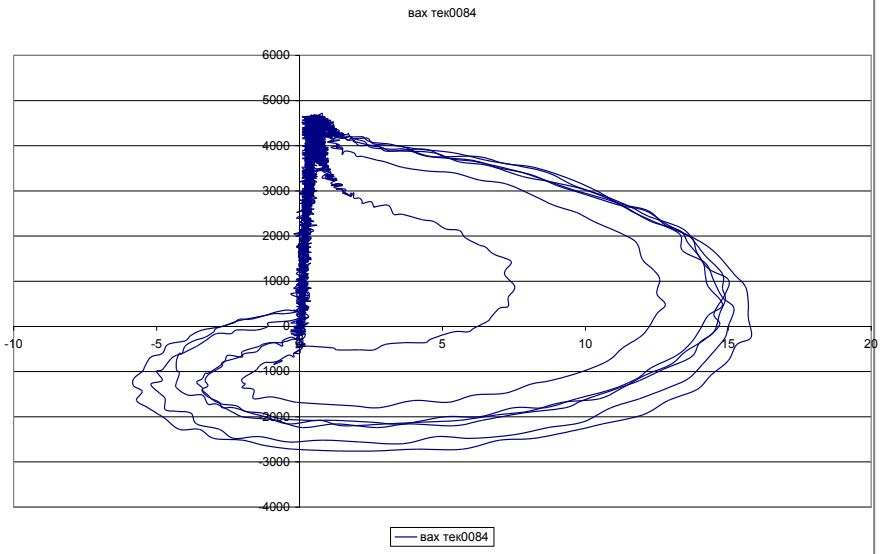


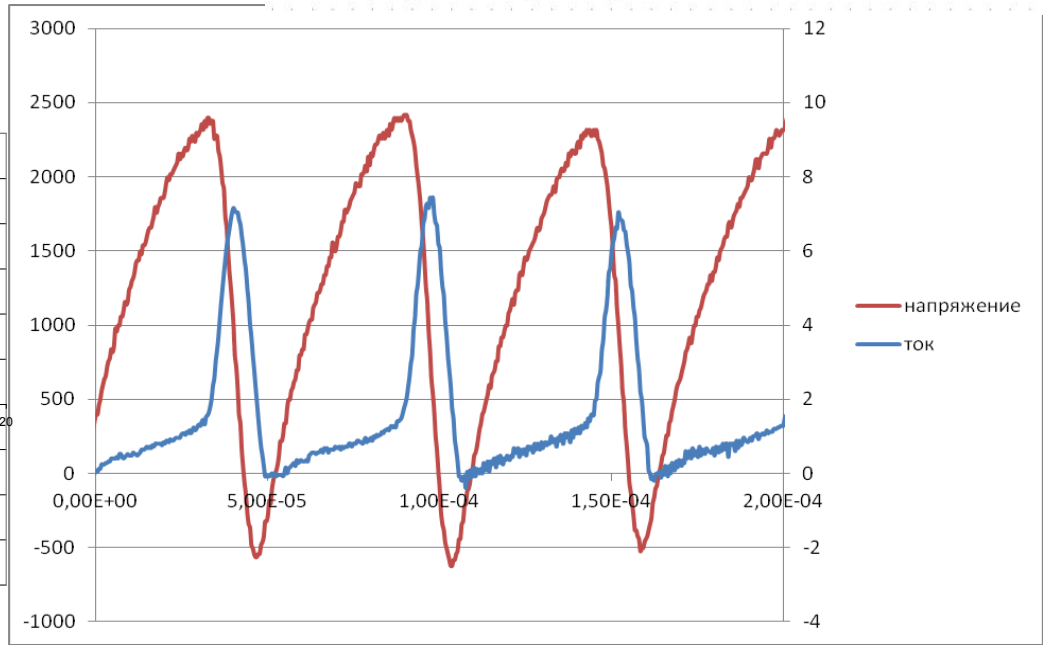
Pulsed Repetitive Regime of Electrical Discharge in PVR

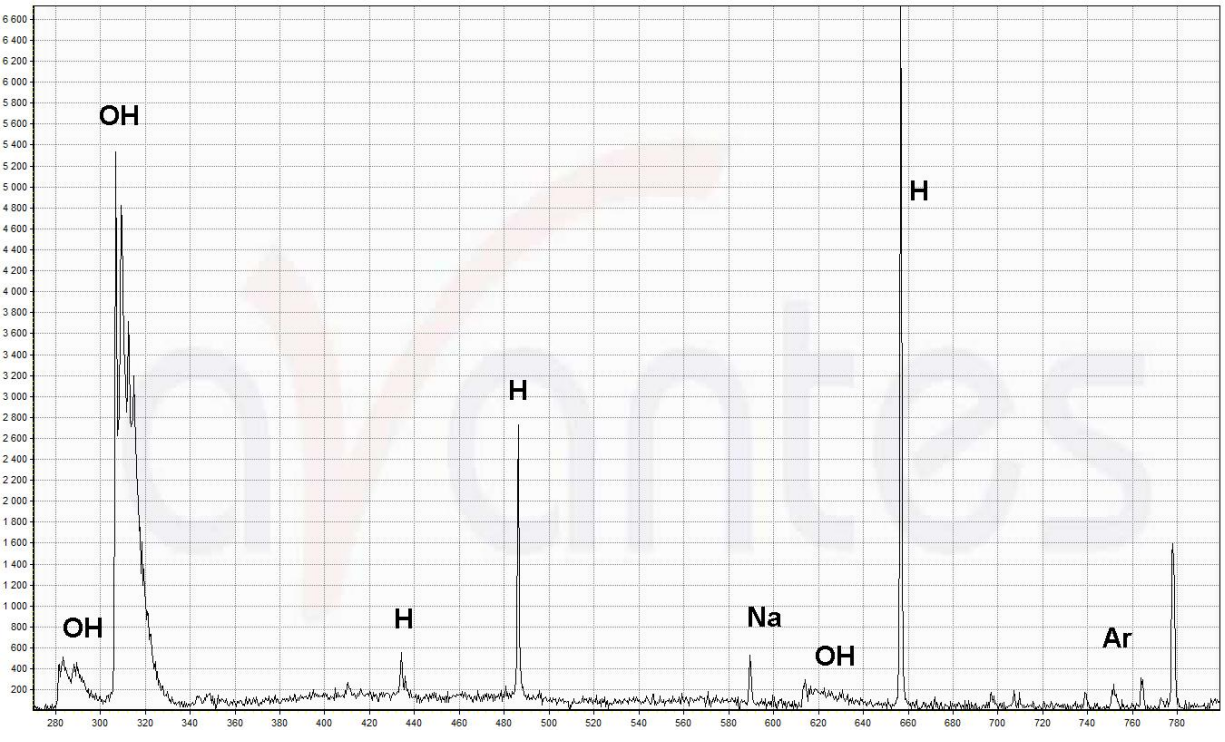
Heterogeneous Plasma with Water Steam Injection











Start of plasmoid creation
*Ni-electrodes

Finish of Plasmoid creation

Time Evolution of Optical Spectrum in Plasmoid

Na-K- Li- CaII-…**Cu II**..**???**