Low Energy Nuclear Reactions on the Cathode of a Chemical Cell

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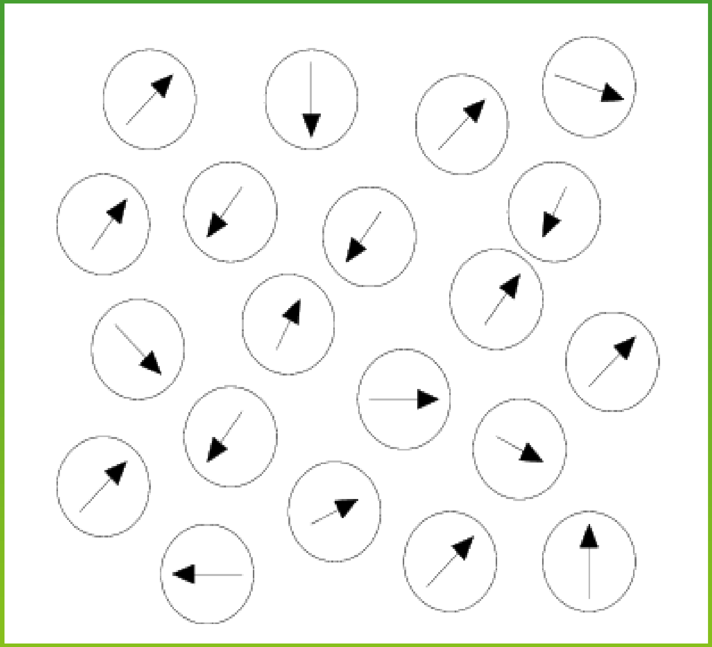
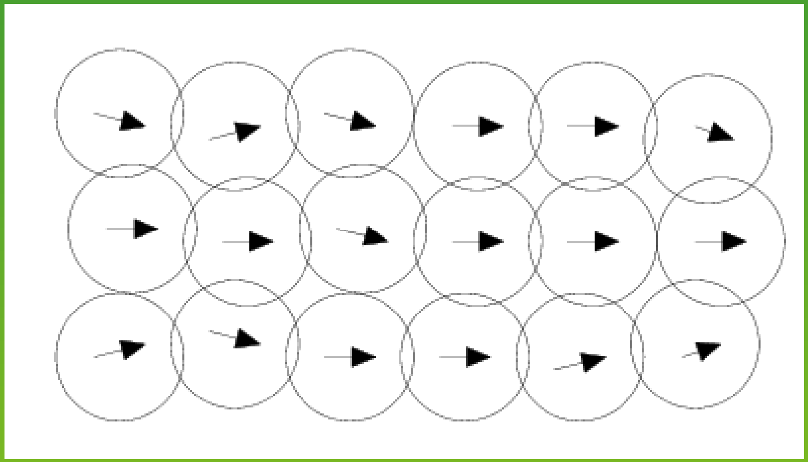
Two Phases of Water I:



Bulk Water is a Fluid Colloidal Suspension of Polarized Domains Floating Within a Background of Normal Water with no Net Ordered Polarization.

Skim Milk is a Dilute Colloidal Suspension of Fat Domains in Bulk Water

Two Phases of Water II:



Interfacial Water is a Liquid Crystal Ferro-electric Wherein Overlapping Polarized Domains Yield a Net Polarization

Cream is a Dense Colloidal Suspension of Fat Domains in Bulk Water

Two Phases of Water III:

Milk from a Cow Phase Separates into Cream Floating on Top of Skim Milk.

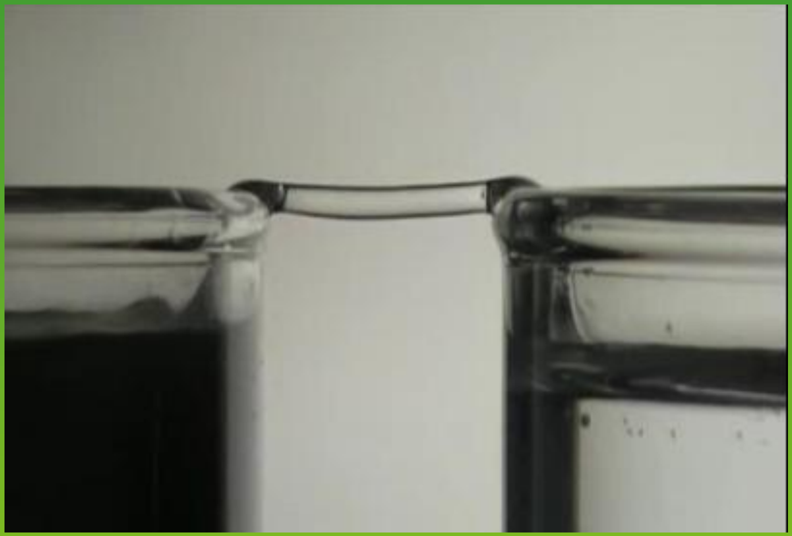
Two Phases of Water IV:

Interfacial Water Floats on Top of the Normal Water Emulsion and a Copper Coin Floats on Top of the Interfacial Water

Two Phases of Water V:

A Bulk Water Droplet Floats on an Interfacial Water Layer Which in Turn Floats on Top of the Bulk Water Emulsion. The Droplet Remains Floating for Seconds of Time Before Suddenly Falling Down into the Water.

Two Phases of Water VI:



Formation of a Water Bridge Across Two Glass Containers. The Container with the Lower Level Has the Cathode while the Container with the Higher Level has the Anode. V is about 15 kilovolt. Water lowers its chemical potential per unit mass $\Delta\zeta = gh$ when storing electronic negative charge .

Cathodes I: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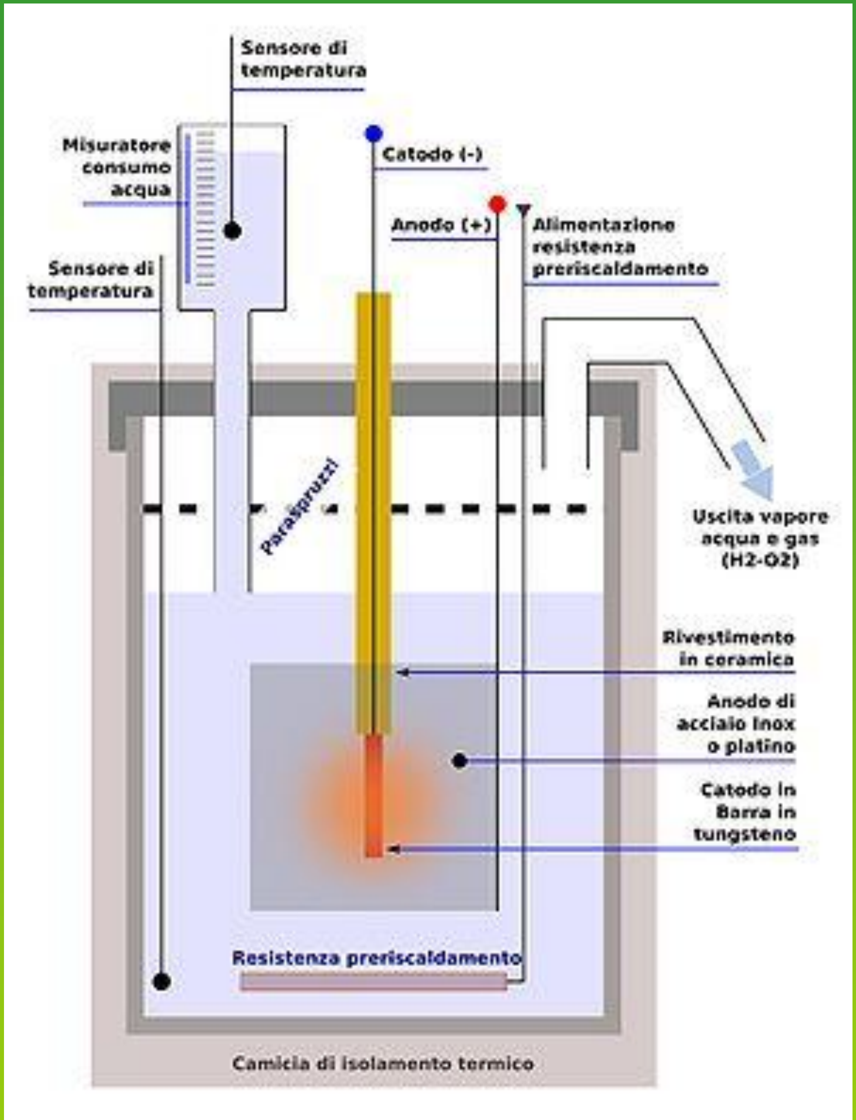
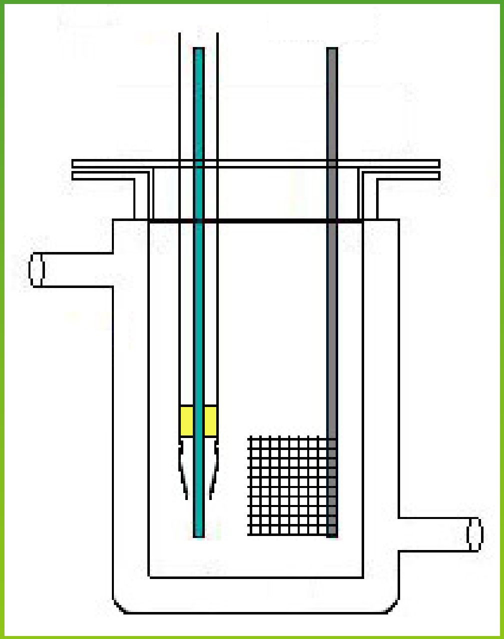
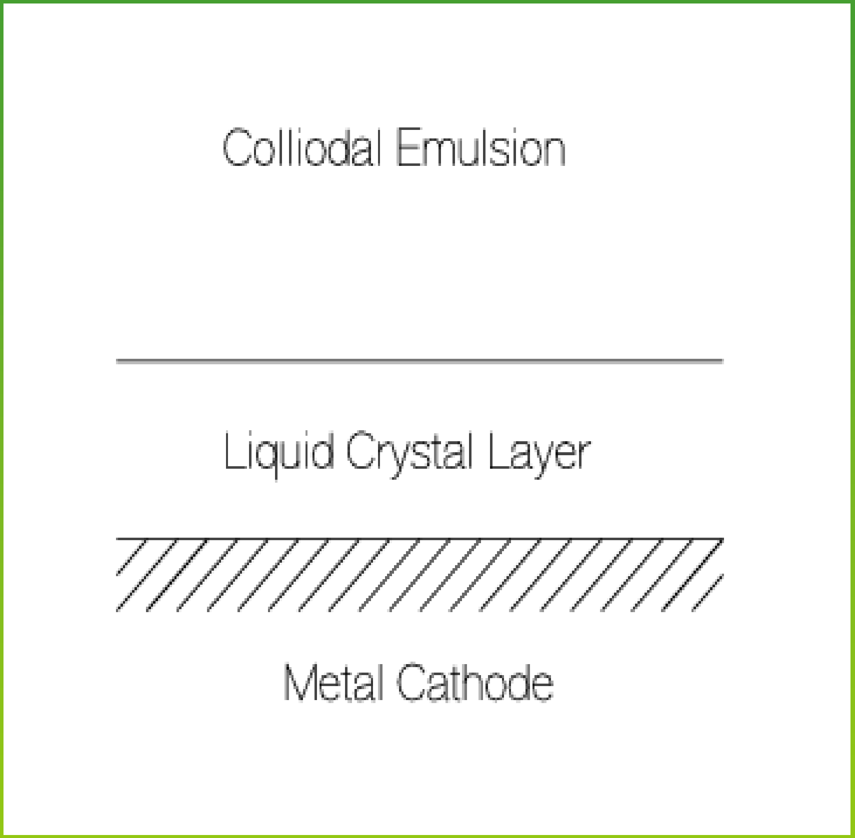

Sensore di temperatura
Misuratore consumo acqua
Catodo (-)
Anodo (+)
Alimentazione resistenza preriscaldamento
Sensore di temperatura
Paraspruzzi
Uscita vapore acqua e gas (H2-O2)
Rivestimento in ceramica
Anodo di acciaio inox o platino
Catodo in Barra in tungsteno
Resistenza preriscaldamento
Camicia di isolamento termico

Cathodes II:



Cathodes III:

Liquid Crystal Interfacial Layer Stores Negative Charged Electrons Pushing Protons Into the Metallic Cathode Making a Metal Hydride and Pushing Positive Ions into the Bulk Water.



Cathode IV:

For zero electric field, the ferroelectric state has neighboring polarization domains leave a configuration on the cathode of

+ - + - + - + - + -

For strong electric fields, the downward polarization leaves only positive charges

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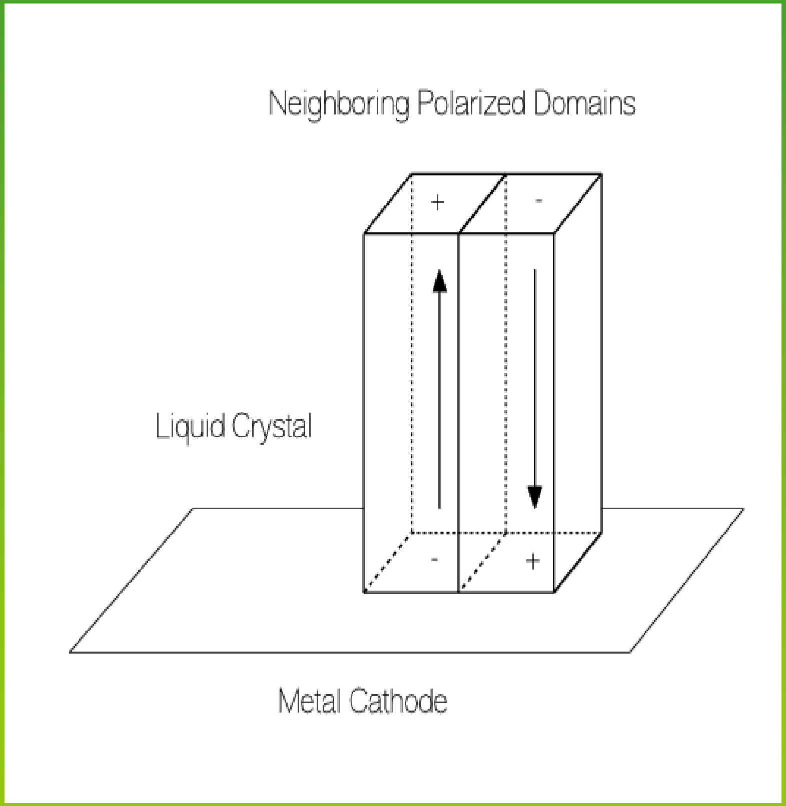
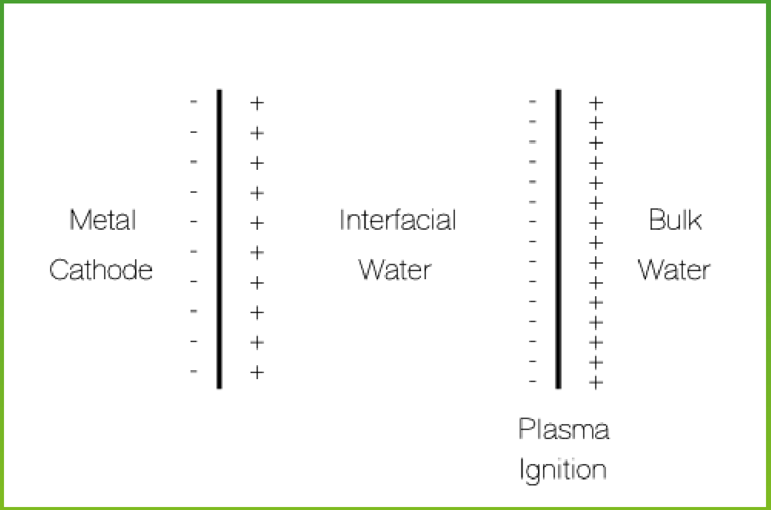


Cathode V:

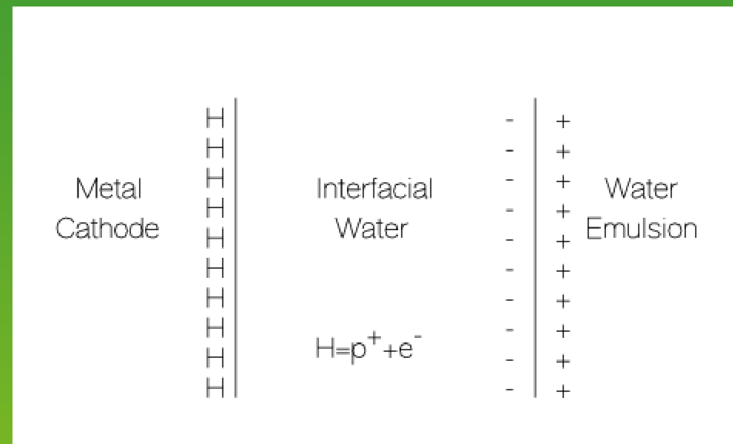
The - + charged ion pairs on the Interfacial water bulk water surface annihilate leaving a neutral molecule while another Electron runs from the cathode to replace the lost electron. The neutral object then ionizes radiating optical photons. The ionized electron then makes it through to the anode yielding



$$e^-(\text{cathode}) \rightarrow e^-(\text{liquid crystal}) \rightarrow e^-(\text{bulk water}) \rightarrow e^-(\text{anode}) + \sum \text{photon}$$

$$eV = \sum \hbar\omega \qquad (\text{plasma glow discharge})$$

Electrolysis I:



$$4e^{-}(\text{cathode}) + 2H_2(\text{interfacial}) \rightarrow 4H(\text{cathode}) + 2O^{--}(\text{interfacial})$$

$$4H(\text{cathode}) \rightarrow 2H_2(\text{gas})$$

$$2O^{--}(\text{interfacial}) + 2H_2O(\text{interfacial}) \rightarrow 4HO^{--}(\text{interfacial})$$

$$4HO^{-}(\text{interfacial}) \rightarrow 4HO^{-}(\text{Bulk Emulsion})$$

$$4HO^{-}(\text{Bulk Emulsion}) \rightarrow 2H_2O(\text{Bulk Emulsion}) + O_2(\text{gas}) + 2e^{-}(\text{anode})$$

$$2H_2O(\text{Bulk Emulsion}) \rightarrow 2H_2O(\text{interfacial})$$

Electrolysis II:

Faradays Law :For every 4F of charge which passes through the cell, two moles of hydrogen gas and one mole of oxygen gas will be produced

F=96,485 Coulomb

$$4e^{-}(\text{cathode}) + 2H_2O \rightarrow 2H_2(\text{gas}) + O_2(\text{gas}) + 4e^{-}(\text{anode})$$

Glow Discharge I:

$$e^-(\text{cathode}) \rightarrow e^-(\text{liquid crystal}) \rightarrow e^-(\text{bulk water}) \rightarrow e^-(\text{anode}) + \sum \text{photon}$$

$$eV = \sum \hbar\omega \qquad (\text{plasma glow discharge})$$

Glow Discharge II:

~220 Volt

~100 Volt

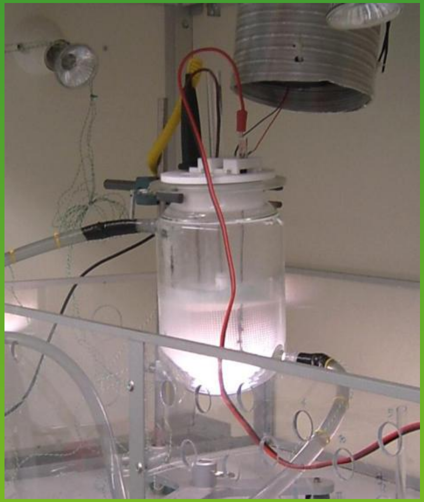
Radiation Subtracts From Faraday's Law

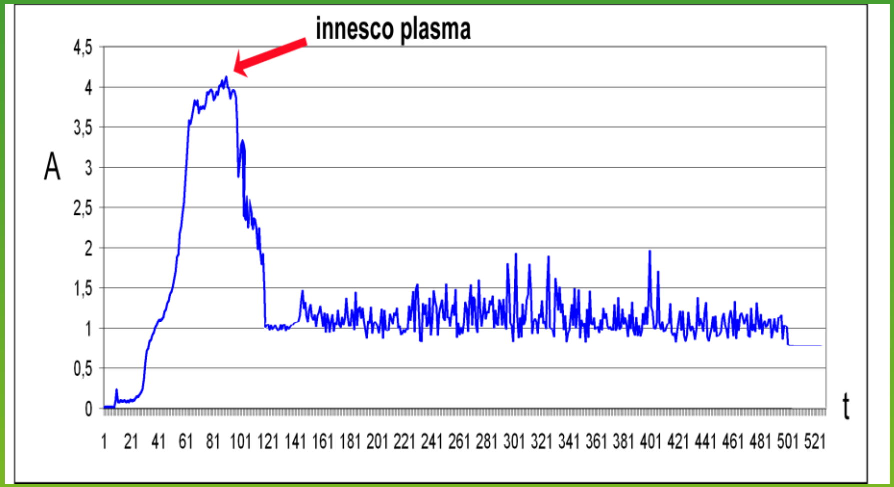
$$e^{-}(\text{cathode}) \rightarrow e^{-}(\text{liquid crystal}) \rightarrow e^{-}(\text{bulk water}) \rightarrow e^{-}(\text{anode}) + \sum \text{photon}$$

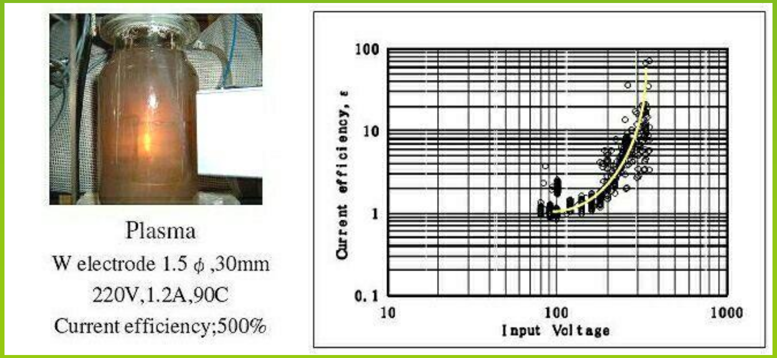
$$eV = \sum \hbar\omega \qquad (\text{plasma glow discharge})$$

$$4e^{-}(\text{cathode}) + 2H_2O \rightarrow 2H_2(\text{gas}) + O_2(\text{gas}) + 4e^{-}(\text{anode})$$

Glow Discharge III:







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Nuclear Transmutations I:

Important Physics Requires Production of Neutrons by Weak Interactions

$$e^{-} + p^{+} \rightarrow n + \nu_e$$

$$(W + M^{+}c^{2}) > Mc^{2}$$

$$W = \sqrt{m^2c^4 + \overline{p^2}c^2}$$

$$\frac{dp}{dt} = eE$$

$$\overline{p^2} = e^2 \int_0^{\infty} S_{EE}(\omega)\frac{d\omega}{\omega^2} = \frac{\overline{E^2}}{\Omega^2}$$

Nuclear Transmutations II:

The glow discharge excites surface plasma modes At mean frequency Ω which n turn yields a fluctuating electric Field E. These quantum electrodynamics fluctuations renormalize the electron energy.

$$e^{-} + p^{+} \rightarrow n + \nu_e$$

$$(W + M^{+}c^{2}) > Mc^{2}$$

$$W = mc^{2}\sqrt{1 + \frac{e^{2}\overline{E^{2}}}{m^{2}c^{2}\Omega^{2}}} = mc^{2}\beta$$

$$\beta > 1$$

Nuclear Transmutations III:

With u as the amplitude of the surface plasma mode displacement, the glow discharge is past the threshold for neutron production.

$$e^- + p^+ \rightarrow n + \nu_e \qquad (\beta mc^2 + M^+c^2) > Mc^2$$

$$\beta = \sqrt{1 + \frac{\overline{E^2}}{E_0{}^2}} = \sqrt{1 + \frac{4e^2\langle |\mathbf{u}|^2 \rangle}{3mc\Omega a^3}} \qquad a = \frac{\hbar^2}{me^2}$$

$$\sqrt{\overline{E^2}} \sim 5E_0 \qquad E_0 \sim 10^7\,\mathrm{Gauss}$$

$$1\,\mathrm{Gauss} \approx 300\ \mathrm{volt/cm}$$

Nuclear Transmutations IV:

$$\beta > \beta_{\text{threshold}} \approx \frac{M_n - M_p}{m} \approx 2.531$$

$$\Gamma_2 \approx \left(\frac{3g_V{}^2 + g_A{}^2}{2\pi^2} \right) \left(\frac{G_F m^2}{\hbar c} \right)^2 \left(\frac{mc^2}{\hbar} \right) n_2 \left(\beta - \beta_{\text{threshold}} \right)^2$$

$$\Gamma_2 \approx \varpi \left(\beta - \beta_{\text{threshold}} \right)^2$$

$$10^{12} \frac{Hz}{cm^2} < \varpi < 10^{14} \frac{Hz}{cm^2}$$

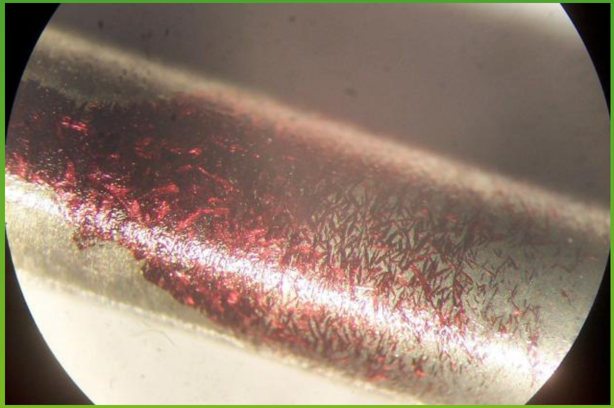
Nuclear Transmutations V:

Nuclear Sequences are of the form shown below.

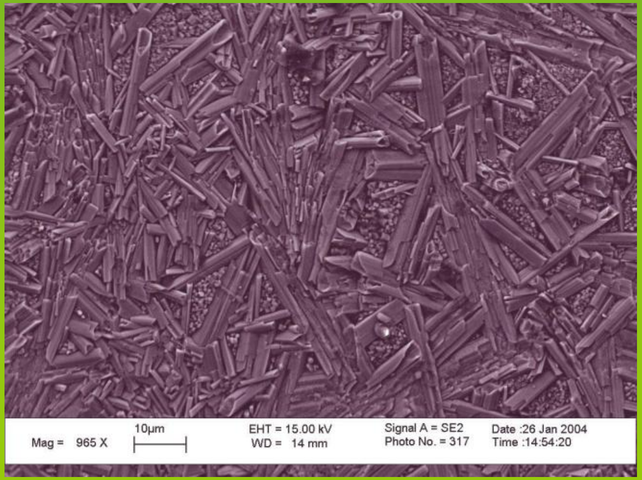
$$n + {}^{A}X_{Z} \rightarrow {}^{A+1}X_{Z}$$

$$^{A}Y_{Z} \rightarrow {}^{A}Y_{Z+1} + e^{-} + \overline{\nu}_{e}$$

Nuclear Transmutations VI:

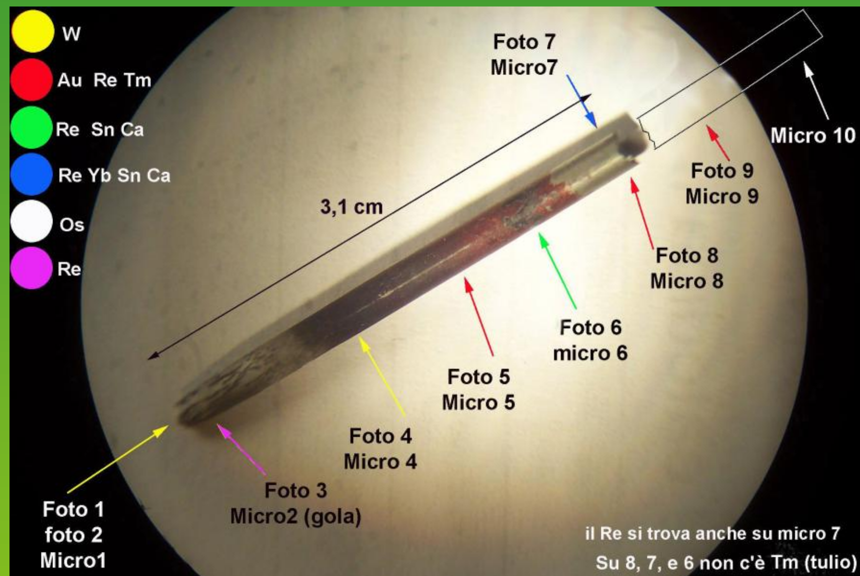


Transmuted Deposit on the Cathode after Prolonged Discharge glow



Grain Size ~ 10microns

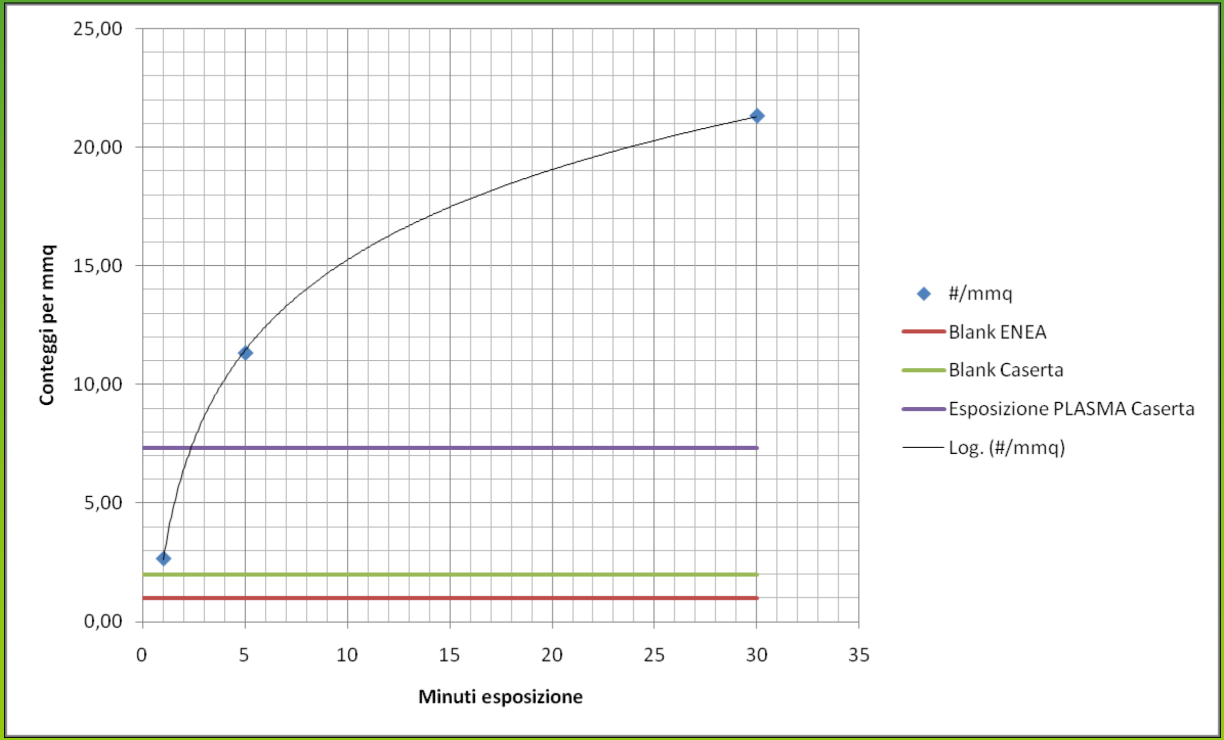
Nuclear Transmutations VII:



64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl
157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97	178.49	180.95	183.84	186.21	190.2	192.2	195.08	196.97	200.59	204.3

Nuclear Transmutations VIII:

Neutrons Have Now Been Directly Observed



Conclusions:

- **Two Kinds of Water in Chemical Cells**
- **Electrolysis is slowed down during glow discharge.**
- **Glow discharges excite cathode surface plasma modes**
- **Neutrons and Nuclear Transmutations are observed.**
- **Agreement between theory and experiment.**
- **The detailed analysis regarding these chemical cells as a nuclear power source is under investigation.**