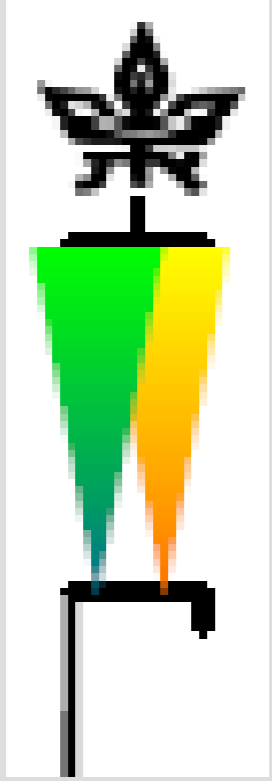


Organización de un Poster

Bullet point abstract, conclusions	Large title: 77 pt	Text in bullet points. No complete sentences	Main headings 44 pt	White or light background
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ELECTRICAL CHARACTERISTICS OF A PLASMA EXCITED BY AN AZIMUTHAL MICROWAVE FIELD

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Abstract

- Develop method to microwave excite gas discharge lamp and minimize envelope heating
- Use circular TE₀₁ mode
- Principle demonstrated with low pressure Ar fill. Practical lamp needs efficient gas fill and impedance matching

Background

- Discharge lamp - most used outdoor light source
- Typical lamps suffer from electrode erosion & include Hg vapor
- Existing Microwave Electrodeless Discharge Lamps (MEDL) require heat distribution mechanism, e.g. bulb rotation

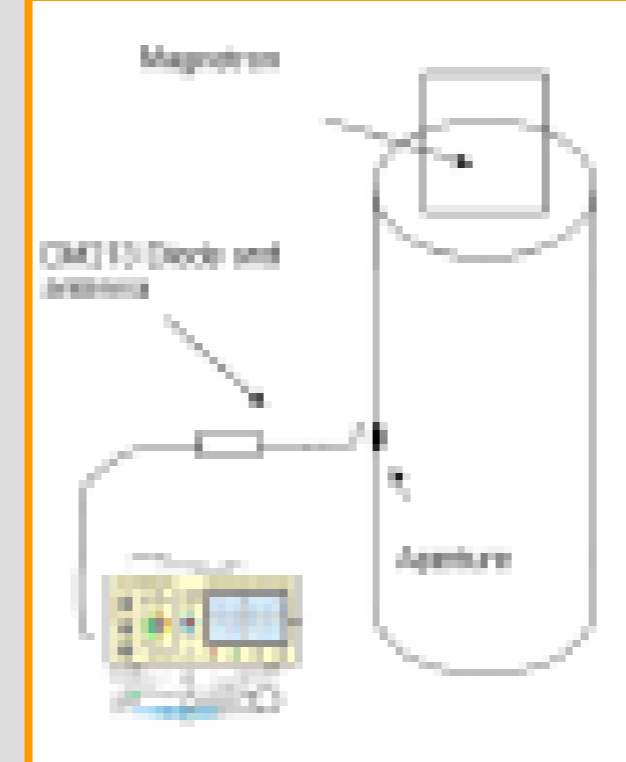
Objectives

- Develop method to excite circular TE₀₁ mode
- Simulate TE₀₁ mode excitation
- Excite an argon plasma using TE₀₁ mode.
- Determine the luminous power of the discharge, & its dependence on pressure
- Measure radiated spectrum
- Determine power balance

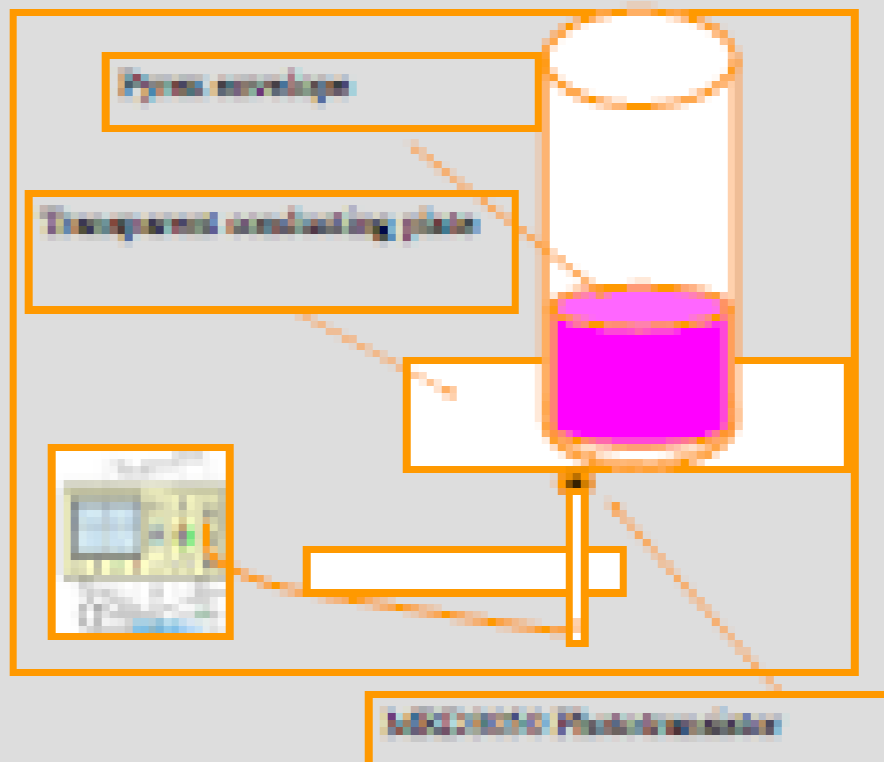
Methodology

- Small loop antenna to excite circular TE₀₁ mode
- CST simulation
- Visualize mode with array of thermal papers
- Illuminance measurements: Pressures of 3.3 to 9.3 mbar
- Illuminance measurements: 5 different locations across the slot
- Illuminance measurements: illuminance as a function of axial position z.
- Temperature measured in 17 different points of discharge chamber.

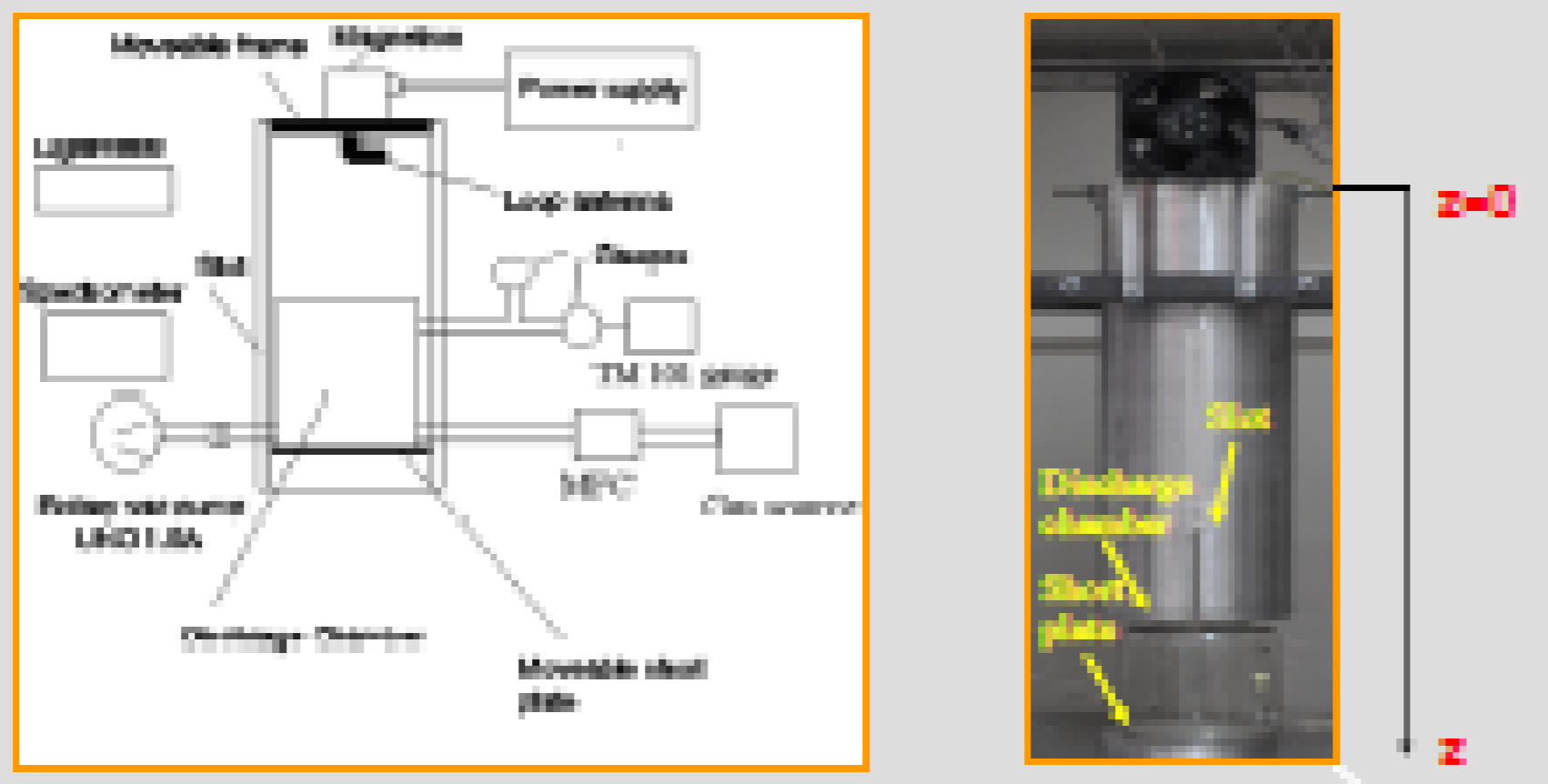
Experimental setup (2)



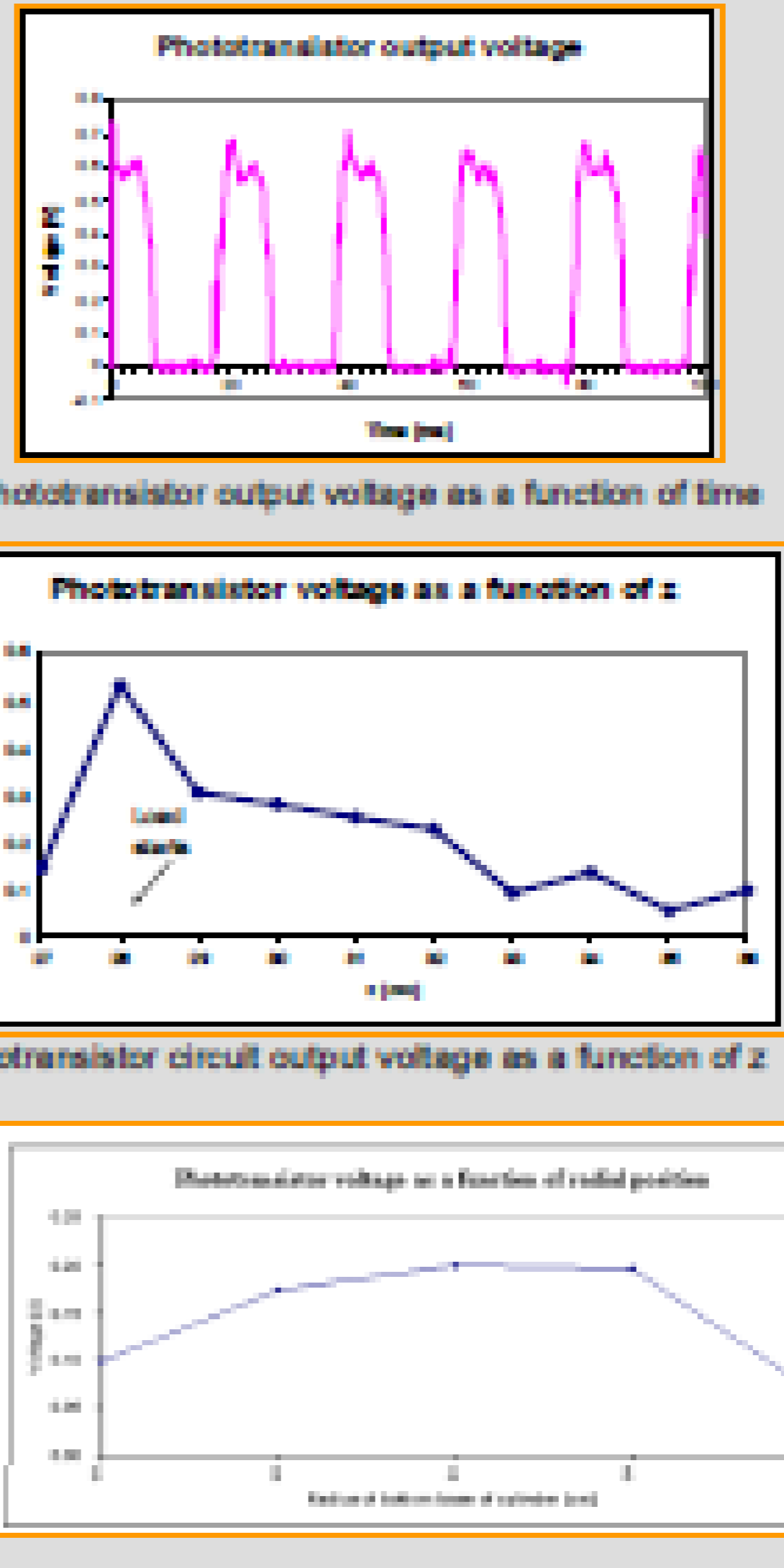
Experimental setup (3)



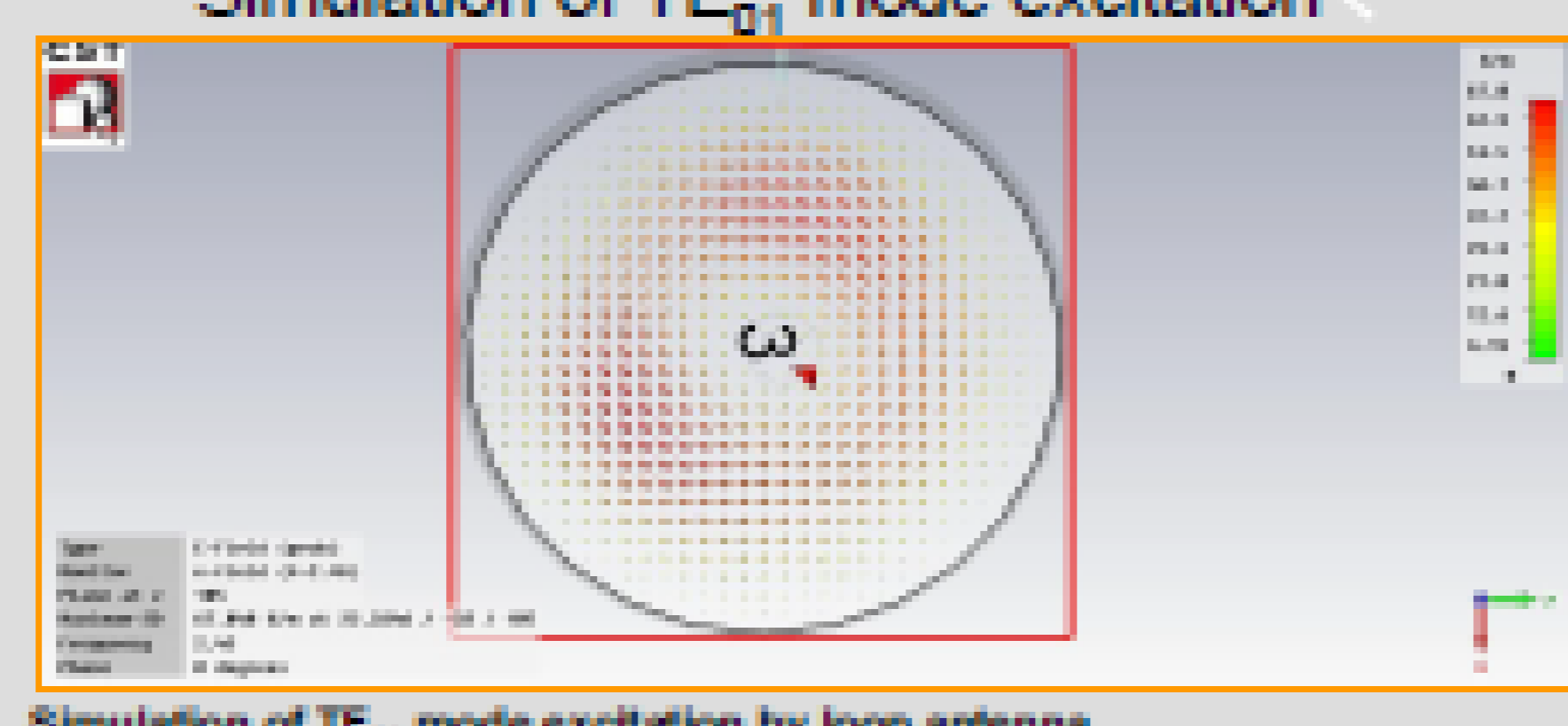
Experimental setup (1)



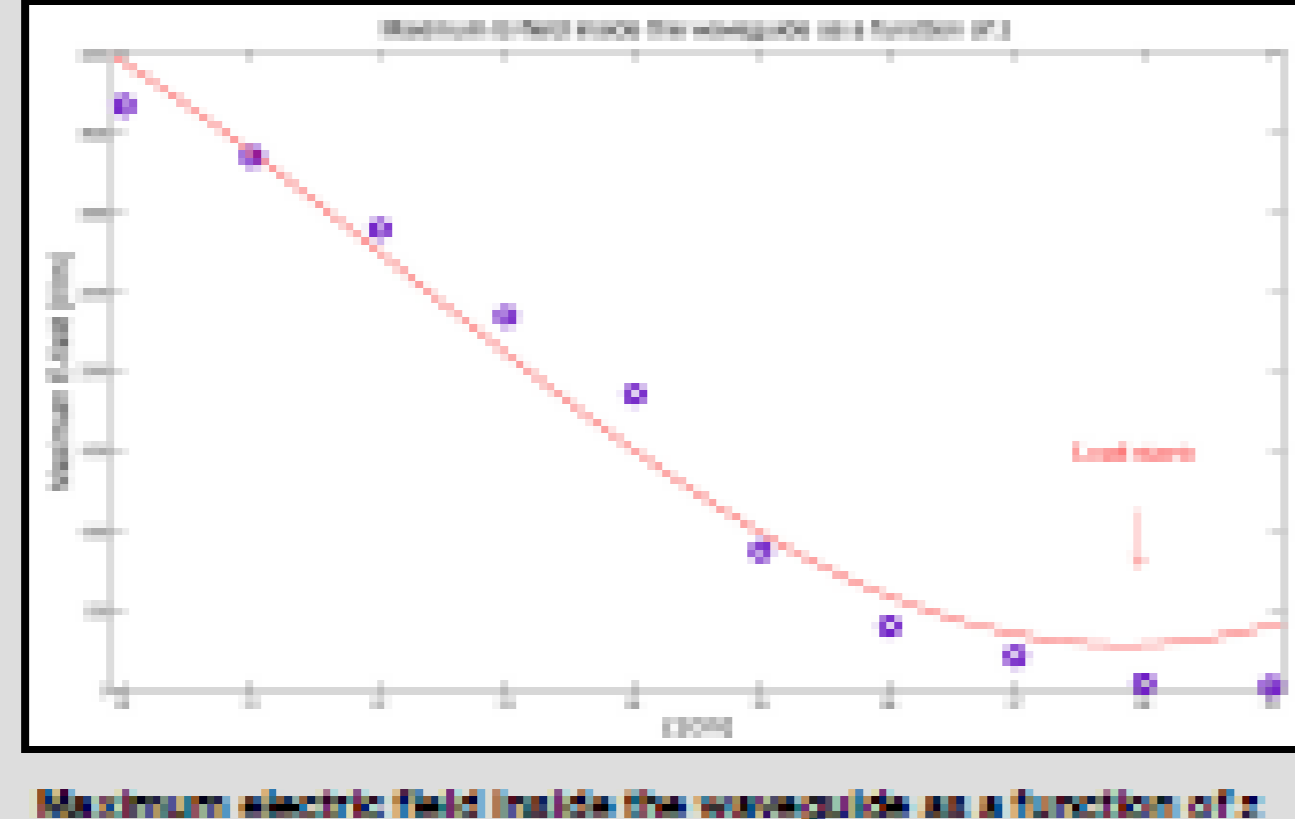
Phototransistor Output



Simulation of TE₀₁ mode excitation



Electric field measured with antenna and diode detector attached near aperture outside of circular waveguide



Parameter	Value
VSWR	17.69
Γ	$0.84e^{j0.23\lambda}$
Z	$(118 + 1113j) \Omega$
P_0	149 W

Determined plasma parameters

Conclusions

- Power converted to luminous power - 12 W
- Power dissipated in discharge chamber - 105 W
- Illuminance increased with pressure
 - because of increased electron collision frequency
- Need to match impedance, use efficient gas fill

Conclusions – in bullet points

90 cm

Figure 4.4. Sample poster.

Photoactivity of titanium dioxide films grown by cathodic arc doped with Cu and N

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MOTIVATION

- Titanium dioxide is a very attractive material for the remediation of environmental pollutants, either in gas phase or in water
- Doping TiO₂ with metallic and nonmetallic species enables to decrease the band gap and increase the photoactivity
- Combining Cathodic Arc Deposition (CAD) and Plasma Immersion Ion Implantation (PIII), TiO₂ films doped with Cu and N were prepared on glass substrates with the aim of evaluating their photoactivity

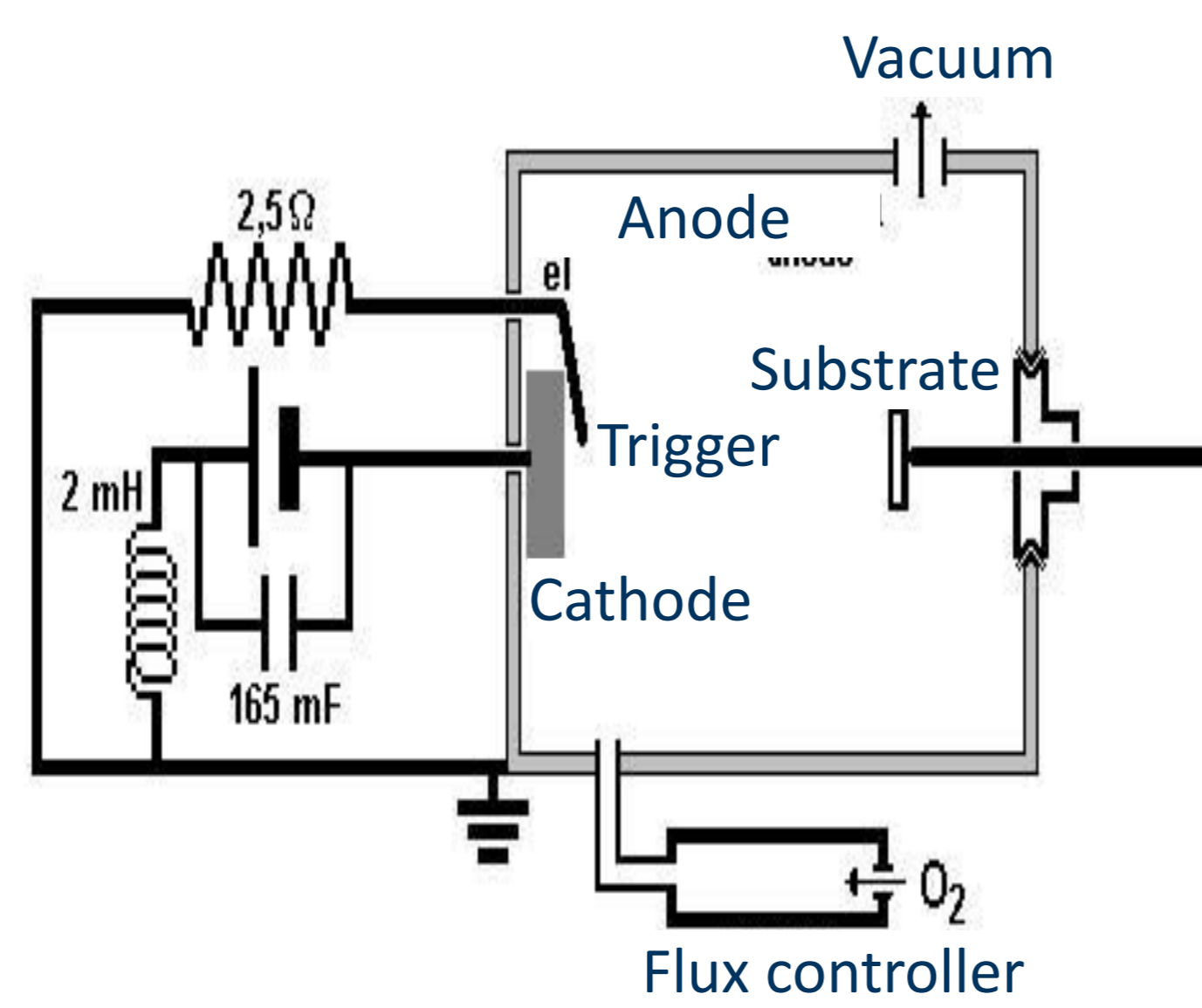
EXPERIMENT

CAD

Cathode: Ti (ϕ 5.5 cm)
Arc current: 100 A
O₂ flux: 40 sccm
Base pressure: ~ 0.01 Pa
Working pressure: ~ 2 Pa
Temperature: 300°C

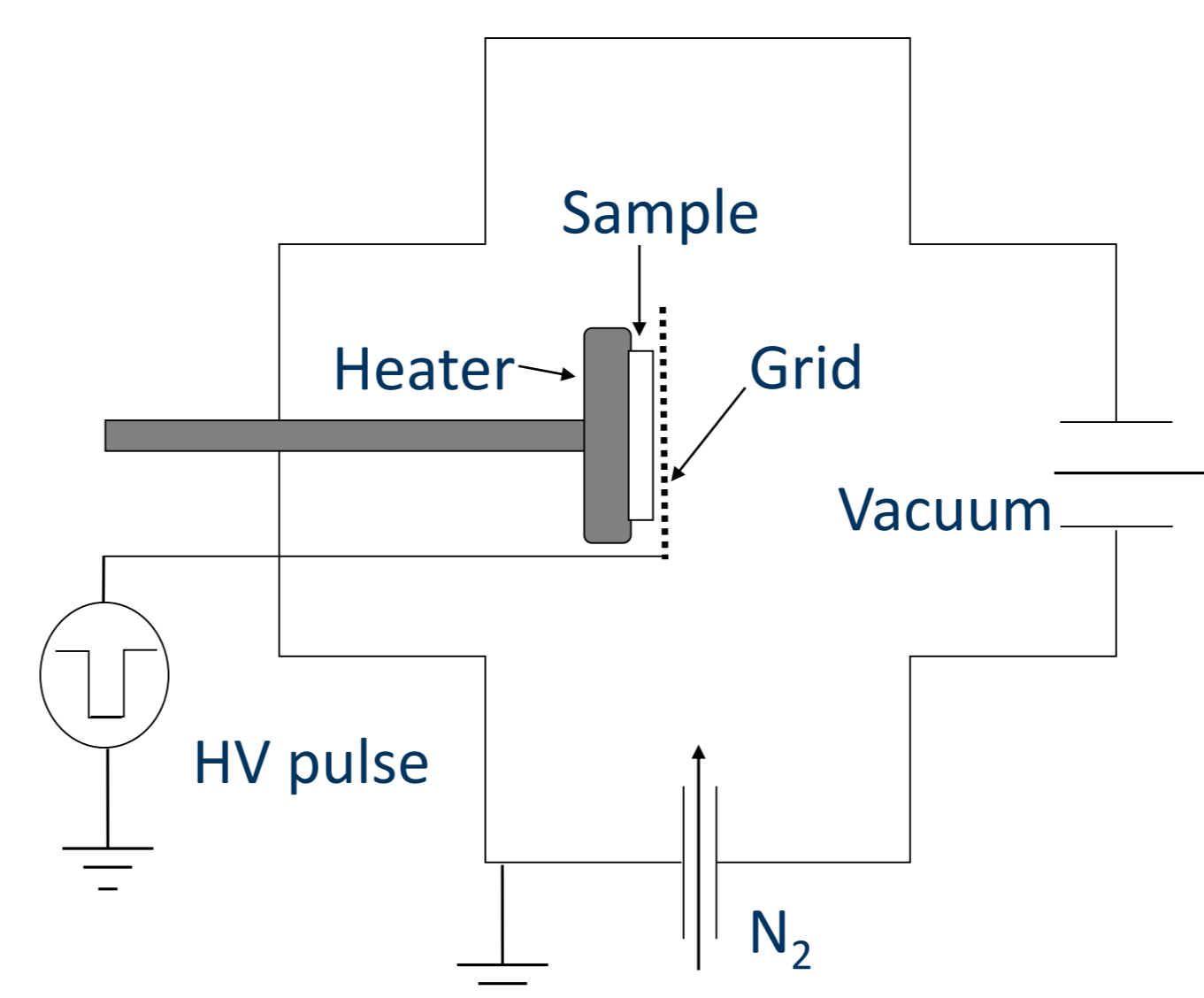
Anatase films on glass

Size: 3x3cm²
Film thickness: 400 – 800 nm



EXPERIMENT

PIII



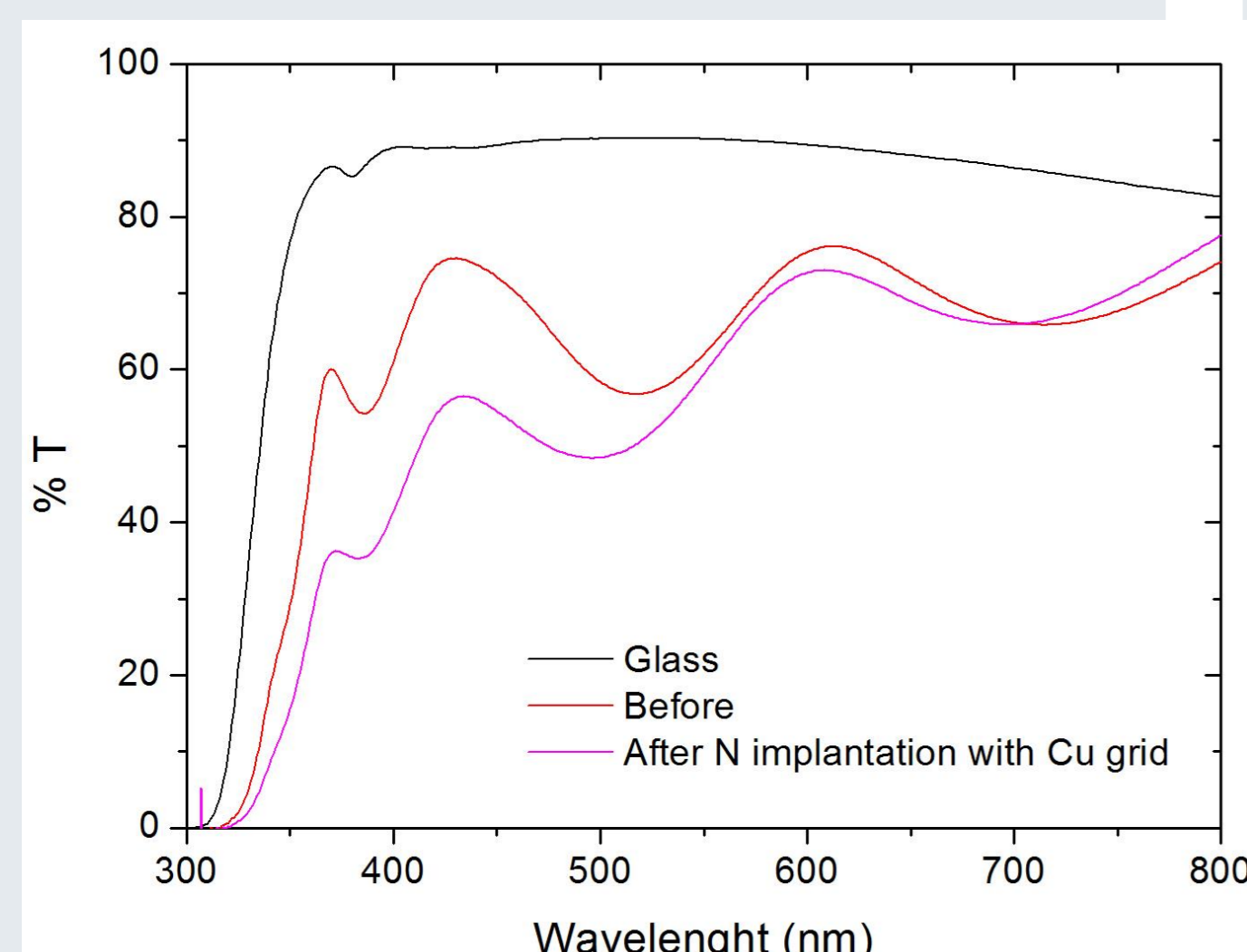
N₂ flux
Base pressure: ~ 0.01 Pa
Working pressure: ~ 100Pa
Temperature: 300°C
Duration: 120 min
HV pulse: - 8 kV, 200 Hz, 50 μs
Grid material: Cu / Ti

PHOTOCATALYTIC TEST

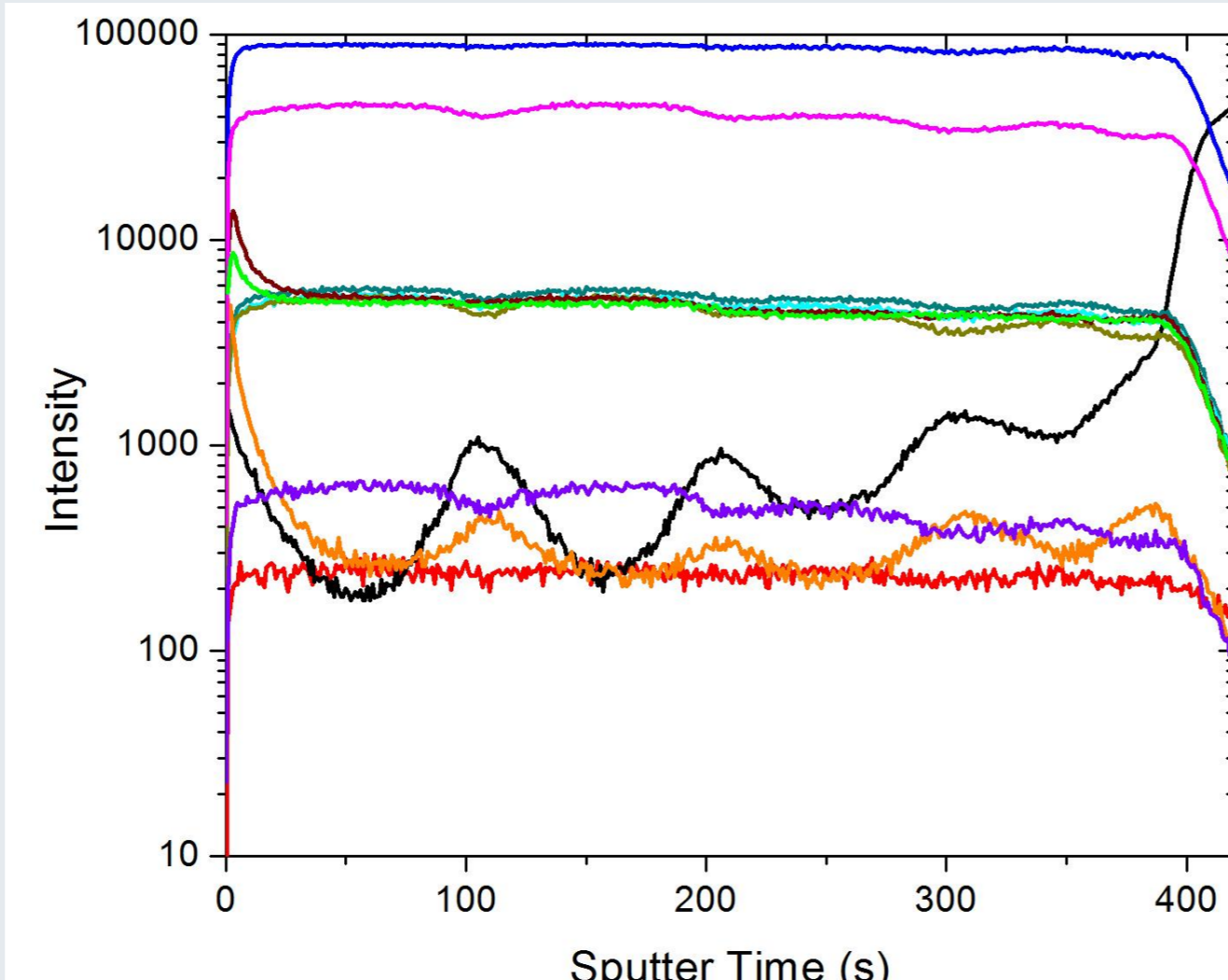
Tested solution: [Cr(VI)]₀ = 0,8 mM, [EDTA] = 1 mM, pH 2 (HClO₄)
UV Lamp: Phillips HPA 400S (maximum emission at 365 nm)
Mean UV irradiance: 3500 μW/cm²
Irradiation time: 6hs

RESULTS

PIII with Copper grid

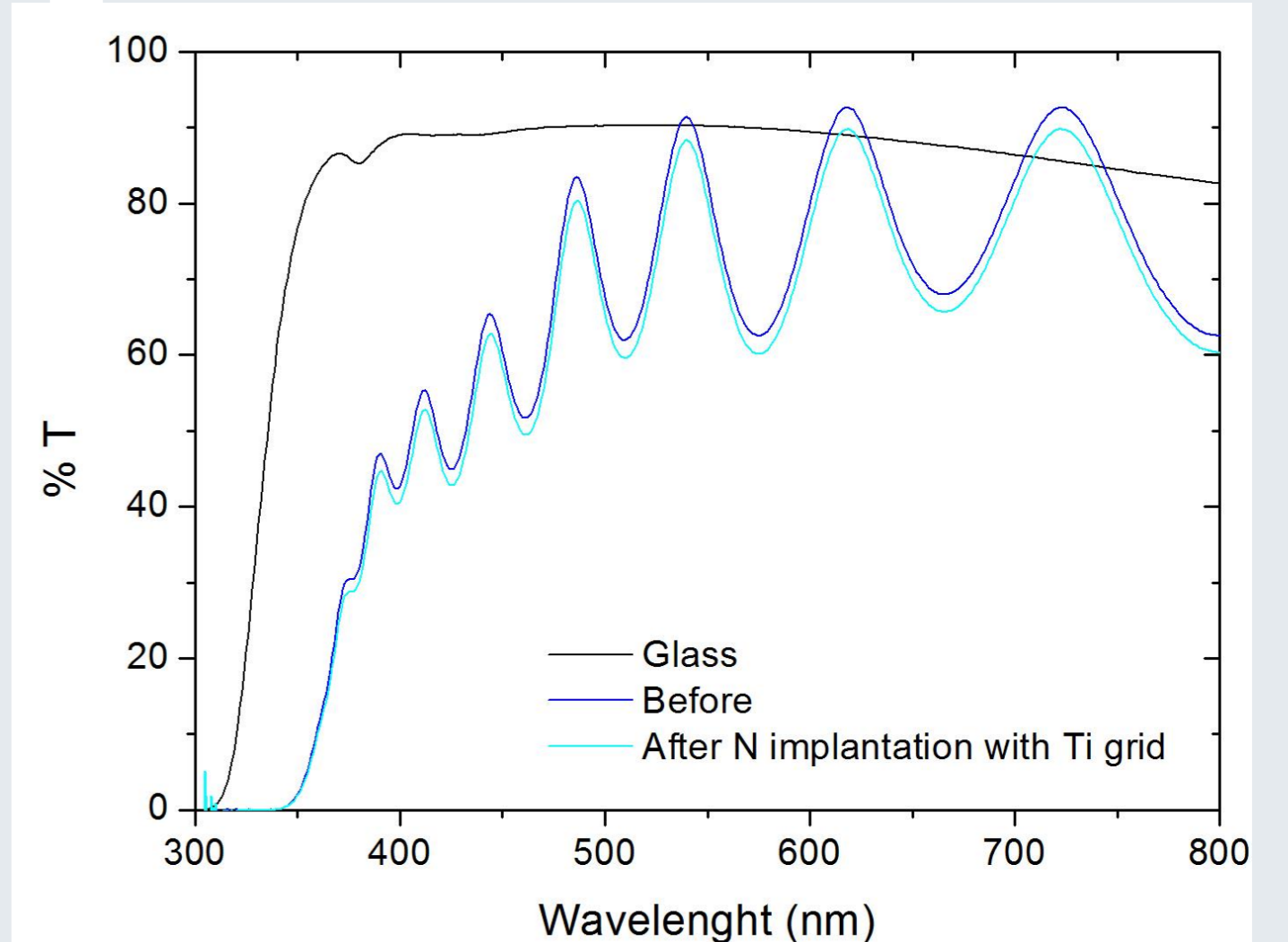
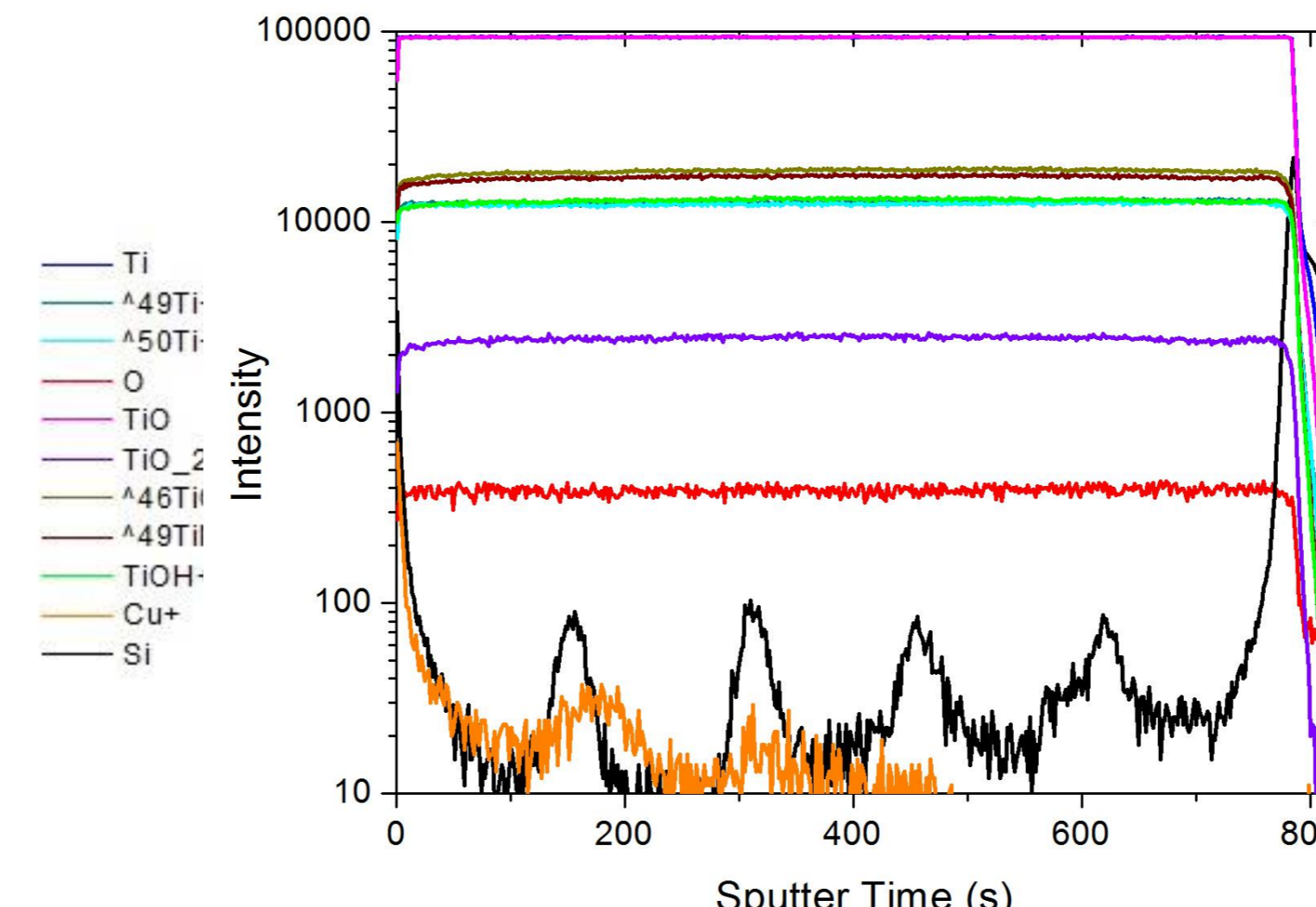


Transmission. Films were studied using an uncoated glass as reference. Band-gap energy changed from (3.35 ± 0.05) to (3.2 ± 0.1) eV

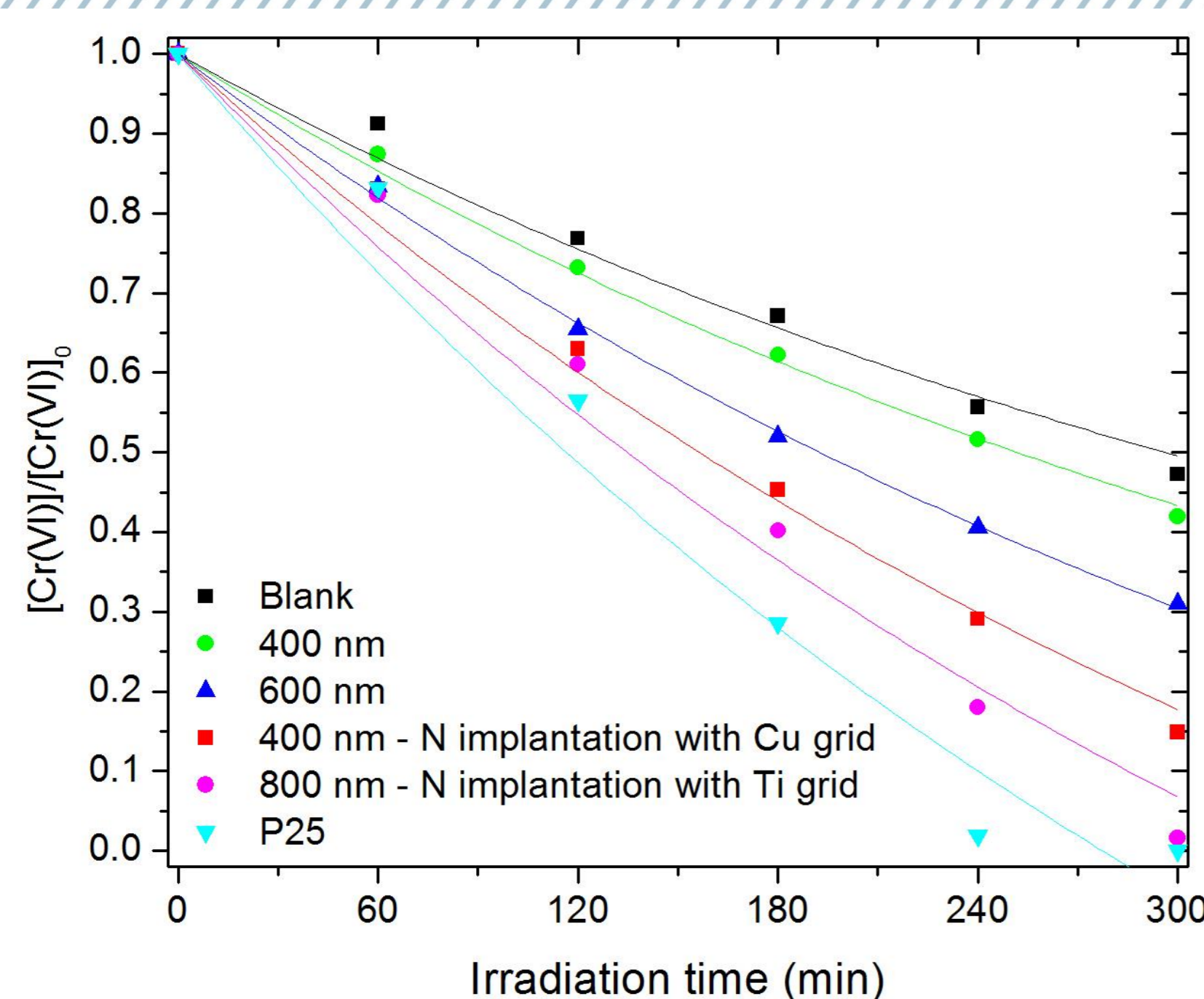


SIMS profile. No significant differences respect to untreated TiO₂ films were observed

PIII with Titanium grid



Transmission. Films were studied using an uncoated glass as reference. No change in band-gap energy, $E_g = (3.25 \pm 0.05)$ eV



Photocatalytic tests. Blank is the system in the absence of photocatalyst. Solid lines represent fittings according to kinetic equation. A P25 film synthesized by dip-coating was studied in order to establish a reference.

Kinetic equation: $-d(C/C_0)/dt = k(C/C_0) + k_0$

k is the constant for photolysis (blank)

k_0 is the constant for heterogeneous photocatalysis (film)

Samples	$k(\text{min}^{-1}) \cdot 10^3$	$k_0(\text{min}^{-1}) \cdot 10^3$	R ²
blank	2.34 ± 0.09	---	0.986
400 nm	2.34 (fixed)	0.29 ± 0.04	0.997
600 nm		0.89 ± 0.02	0.999
400 nm - Cu grid		1.48 ± 0.08	0.993
800 nm - Ti grid		2.0 ± 0.2	0.982
P25		2.56 ± 0.01	0.962

Final remarks

- After PIII treatment in N₂ atmosphere, only slight changes in transmission and band-gap were observed when the copper grid was used.
- Photocatalytic activity (PCA) of TiO₂ increased with the film thickness.
- Cu-doped samples showed higher PCA than untreated samples. Their performance were even better than thicker untreated films.
- By extrapolating the results obtained for untreated samples to larger thicknesses, PIII with Ti grid also seems to enhance the PCA.

Evaluación de correlaciones para la determinación del coeficiente de transferencia de calor en flujo transversal en un solo tubo

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INTRODUCCIÓN

Los intercambiadores de flujo cruzado son comúnmente usados cuando es necesario transferir calor [1].

El movimiento altamente desordenado de los fluidos que, en general, se tiene a altas velocidades se conoce como turbulento. Lo común es que el flujo de fluidos de baja viscosidad, como el aire a altas velocidades, sea turbulento. El régimen de flujo influye mucho en la potencia requerida para el bombeo [2]. El número de Nusselt puede ser obtenido con el uso de las correlaciones, todas basadas en la condiciones globales del régimen del flujo en cual se realiza la operación, las correlaciones sirven para aproximar el valor del coeficiente de transferencia de calor en regímenes determinados. A modo de dar continuidad a las investigaciones de transferencia de calor en flujo transversal en un tubo, se plantea como objetivo comparar los valores de coeficiente de transferencia de calor, obtenidos utilizando las correlaciones de Hilper, Zhukauskas, Churchill y Bernstein, Whitaker, Eckert y Drake.

Palabras claves: Correlaciones, intercambiador de calor, coeficiente de transferencia de calor, turbulento.

METODOLOGÍA

El equipo utilizado es el intercambiador de calor de flujo transversal en un solo tubo H350. [3].

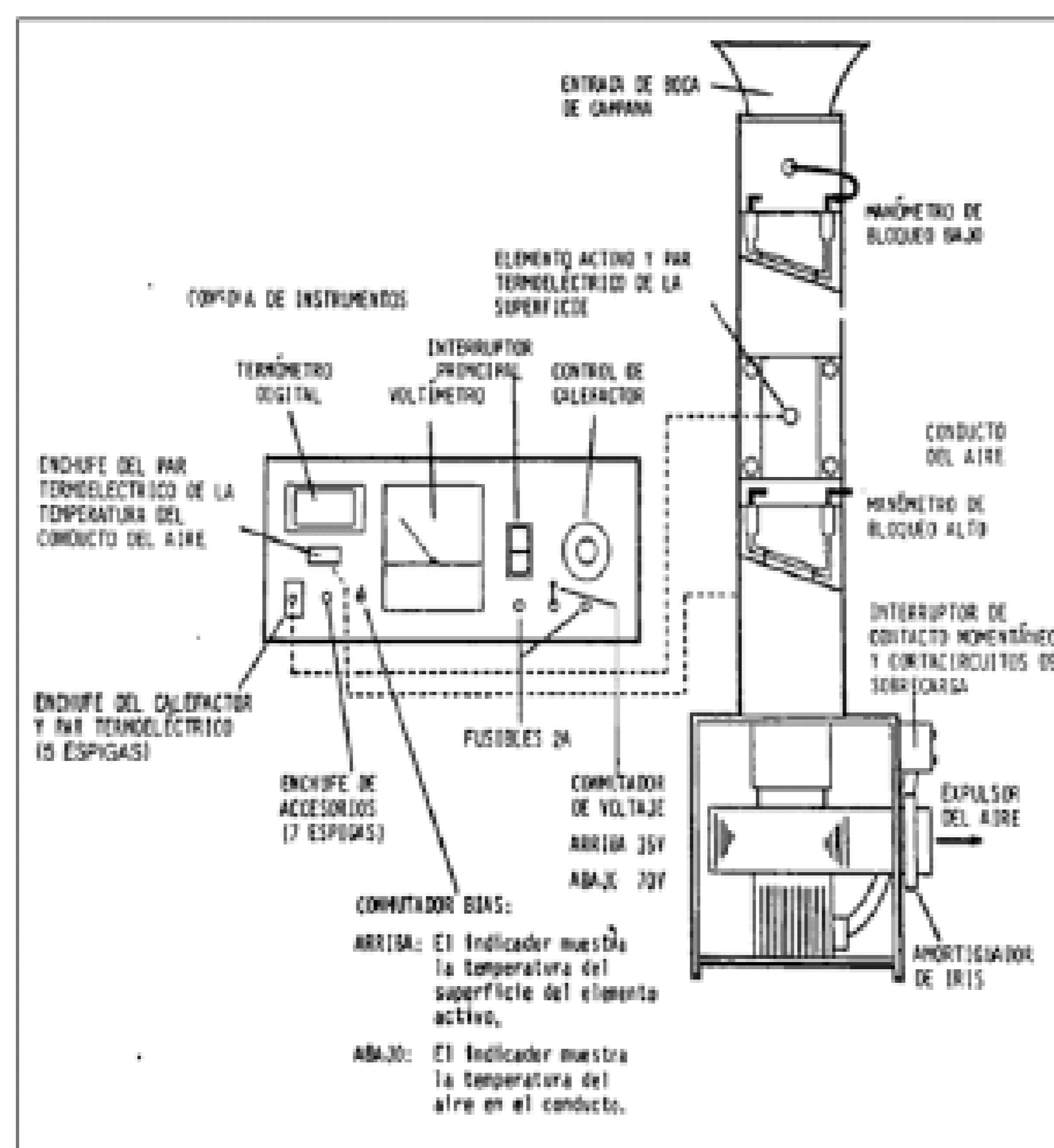


Figura 1. Intercambiador de flujo transversal[3].

Se realizaron 8 experimentos, las correlaciones utilizadas fueron:

$$\text{Whitaker} \quad Nu = (0,4Re^{0,5} + 0,06Re^{2/3})Pr^{0,4} \left(\frac{\mu}{\mu_p} \right) \quad (1)$$

$$\text{Ecker y Drake} \quad Nu = (0,250Re^{0,6})Pr^{0,38} \left(\frac{Pr}{Pr_p} \right) \quad (2)$$

$$\text{Hilper} \quad Nu = CRe^m Pr^{1/3} \quad (3)$$

$$\text{Churchill y Bernstein} \quad Nu = 0,3 + \frac{0,62Re^{1/2} Pr^{1/3}}{[1 + (0,4Pr)^{2/3}]^{1/4}} \left[1 + \left(\frac{Re}{282000} \right)^{5/8} \right]^{4/5} \quad (4)$$

$$\text{Zhukauskas} \quad Nu = CRe^m Pr^n \left(\frac{Pr}{Pr_s} \right)^{1/4} \quad (5)$$

RESULTADOS

Resultados

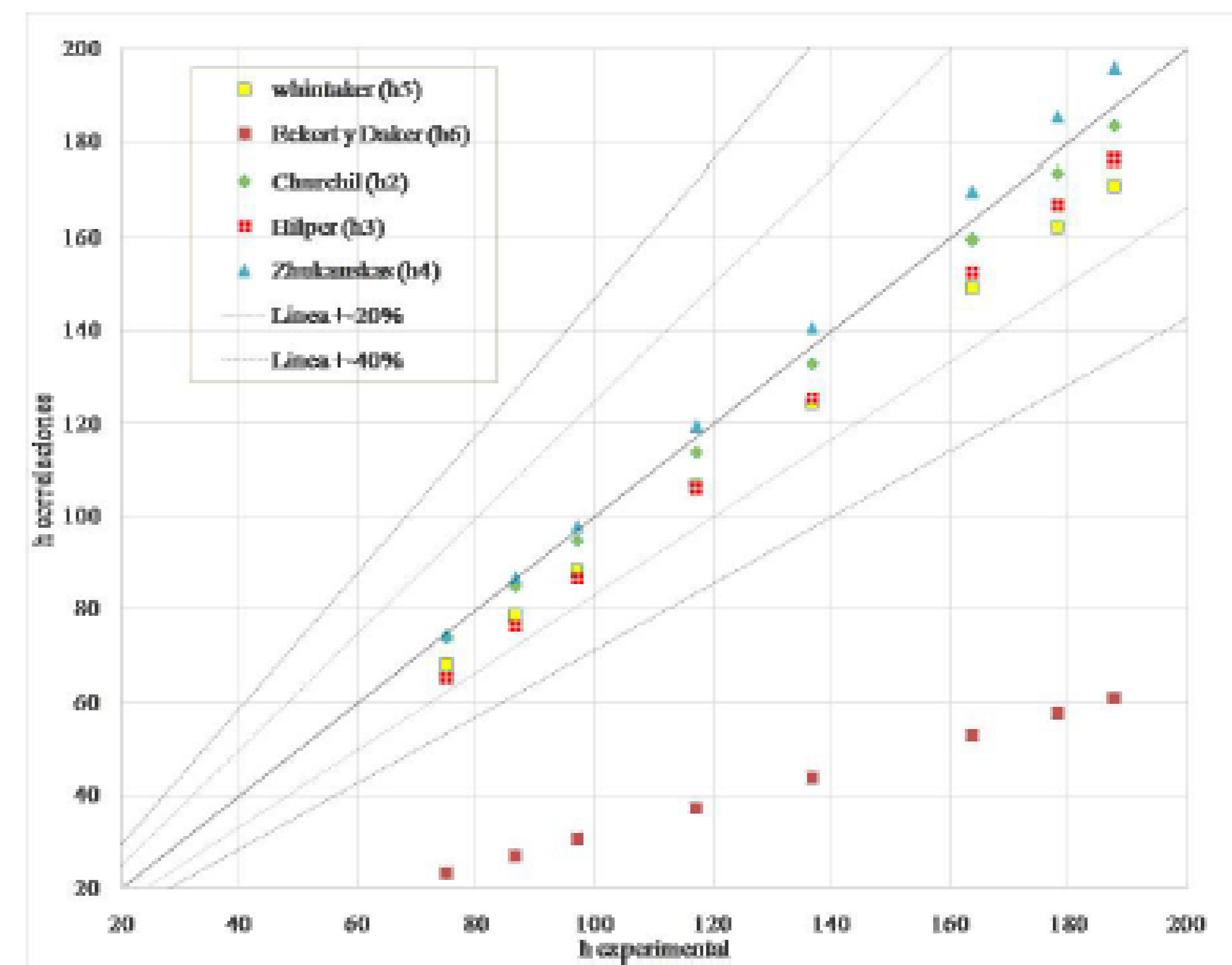


Figura 3. Comparación de los valores experimentales de los coeficientes de transferencia de calor con los valores obtenidos mediante correlaciones.

Análisis

En las correlaciones de Zhukauskas, Churchill, Whitaker y Hilper se observa que se encuentran dentro del 20% de aproximación a los valores experimentales. En cuanto a la correlación de Eckert se observa que se encuentra muy alejado del valor obtenido experimentalmente, esto se debe a que dicha correlación posee una restricción de operación, la cual establece un rango de Reynolds que varía de 10^3 hasta 10^5 . Con los datos obtenidos, la correlación de Zhukauskas proporciona una buena aproximación, que se ajusta con los valores experimentales, siguiéndole la correlación de Churchill, donde las medias a partir de la diferencia realizada con coeficientes de transferencia de calor para estas dos correlaciones y los valores experimentales fueron de 2,11 y 2,57 respectivamente.

CONCLUSIÓN

Se observó que la correlación que más se ajusta al coeficiente de transferencia de calor obtenido experimentalmente fue la obtenida mediante la correlación de Zhukauskas, seguida a ésta la correlación Churchill. La correlación de Eckert y Drake fue la que presentó mayor desviación del valor experimental.

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