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Advanced Oxidation Processes
as Alternative to Standard Whitening Methods

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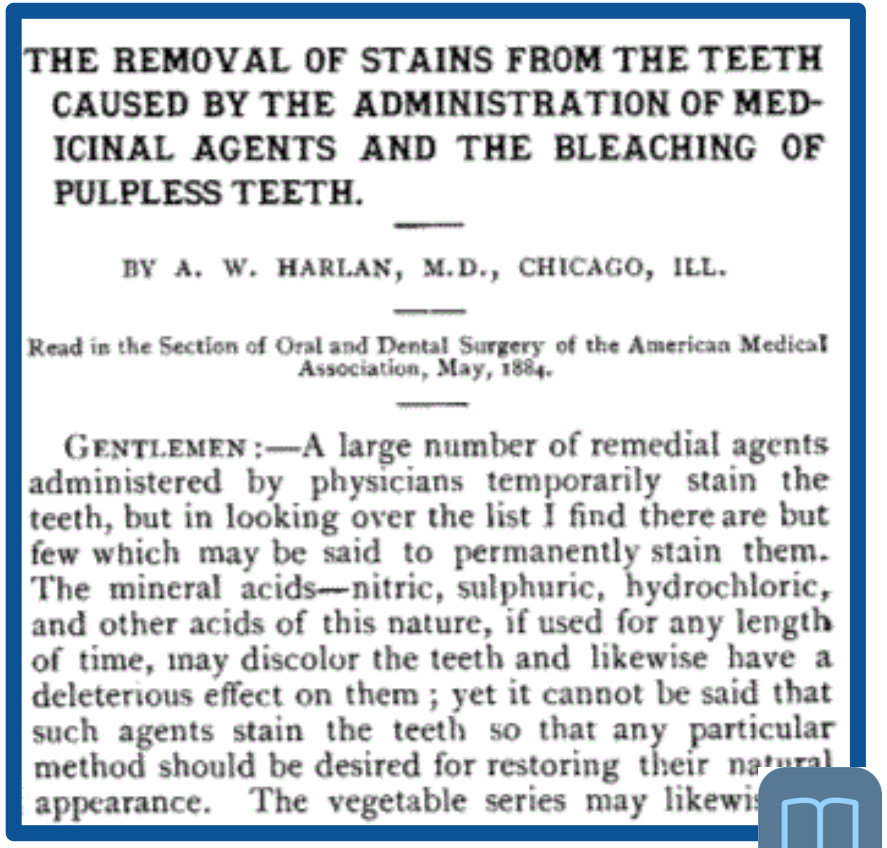
Introduction



THE REMOVAL OF STAINS FROM THE TEETH CAUSED BY THE ADMINISTRATION OF MEDICINAL AGENTS AND THE BLEACHING OF PULPLESS TEETH.

BY A. W. HARLAN, M.D., CHICAGO, ILL.

Read in the Section of Oral and Dental Surgery of the American Medical Association, May, 1884.

GENTLEMEN:—A large number of remedial agents administered by physicians temporarily stain the teeth, but in looking over the list I find there are but few which may be said to permanently stain them. The mineral acids—nitric, sulphuric, hydrochloric, and other acids of this nature, if used for any length of time, may discolor the teeth and likewise have a deleterious effect on them; yet it cannot be said that such agents stain the teeth so that any particular method should be desired for restoring their natural appearance. The vegetable series may likewi

JAMA, **1885**; IV(5):123-125

H_2O_2 (1.8 V)

(Oppenländer T. 2003)

H_2O_2

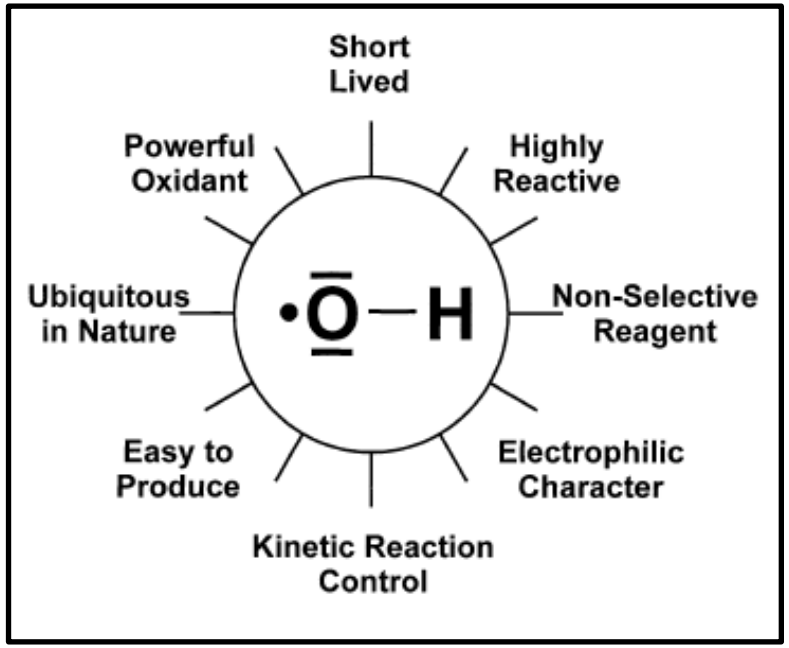
Effectiveness of Light Sources on In-Office Dental Bleaching: A Systematic Review and Meta-Analyses

JR SoutoMaior • SLD de Moraes • CAA Lemos
BC do E Vasconcelos • MAJR Montes • EP Pellizzer

Operative Dentistry. **May/June 2019**, Vol. 44, No. 3.

AOPs: Advanced Oxidation Processes

AOPs: Advanced Oxidation Processes



(Oppenländer T. 2003)

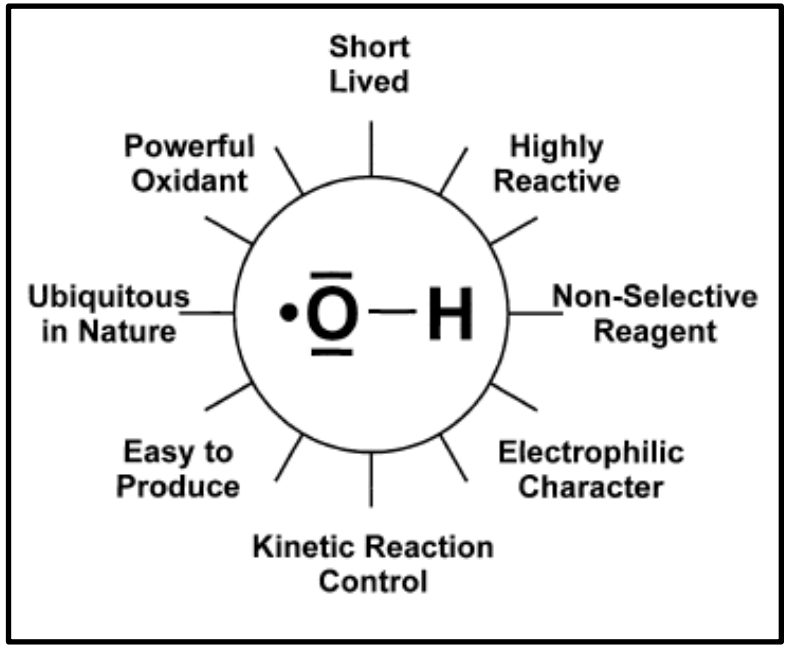
OH• (2.8 V)

X

H_2O_2 (1.8 V)

Whitening Method in Dentistry

AOPs: Advanced Oxidation Processes



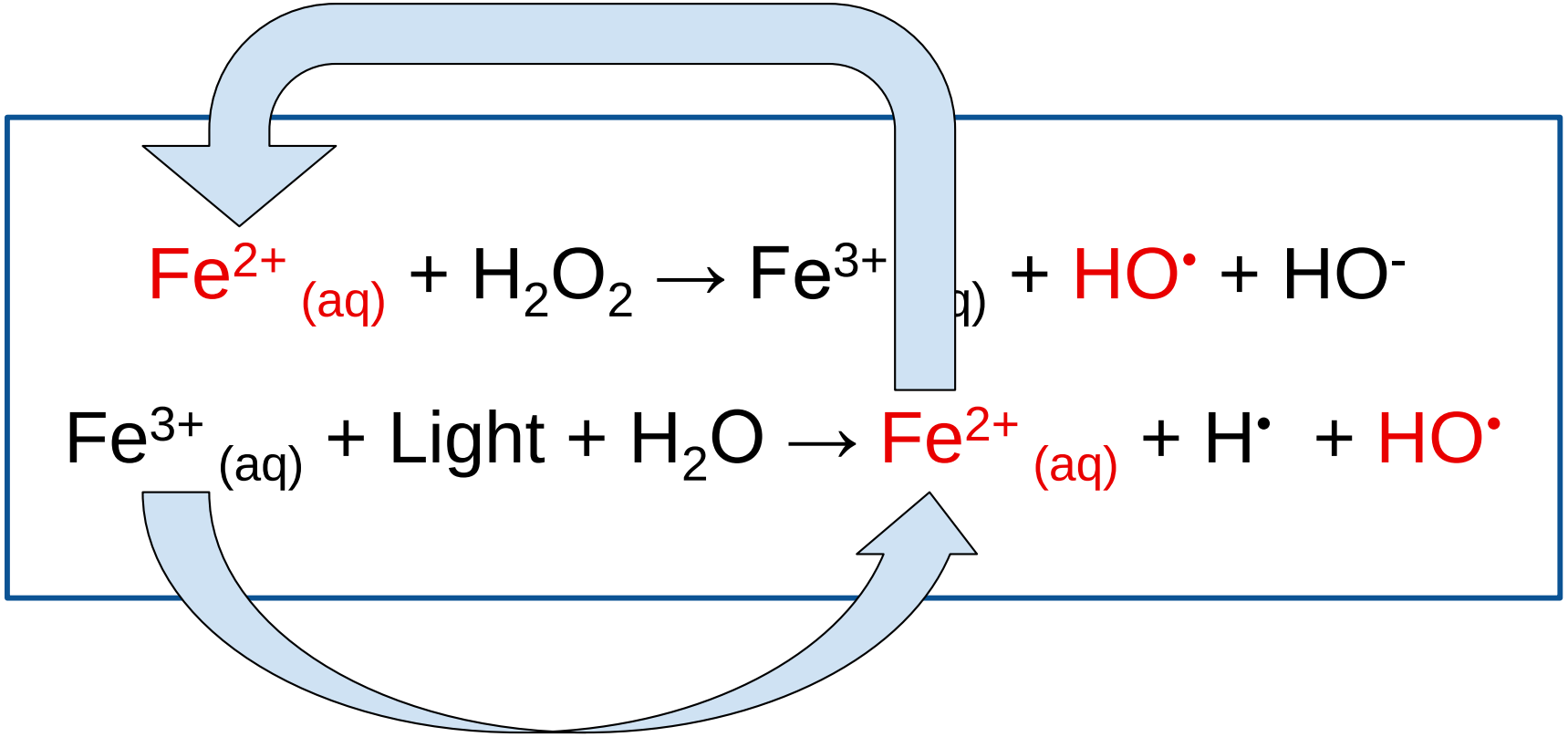
(Oppenländer T. 2003)

Hydroxyl (OH•) based AOPs

- H_2O_2 + UV
- O_3 + UV
- H_2O_2 + Fe
- H_2O_2 + Fe + Light
- TiO_2 + UV

AOPs: Advanced Oxidation Processes

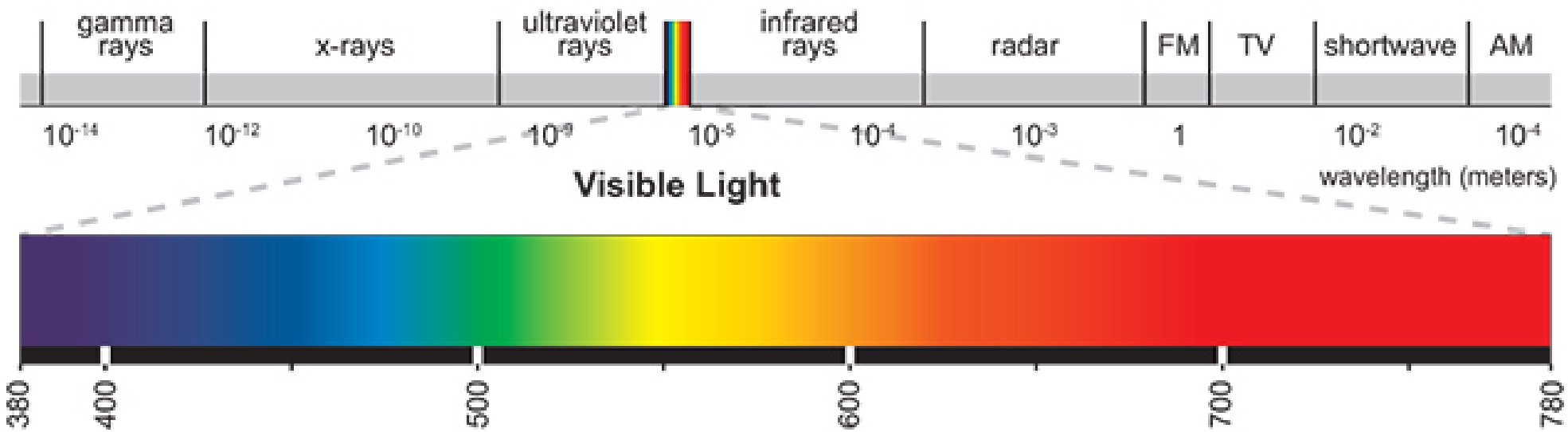
Photo-Fenton



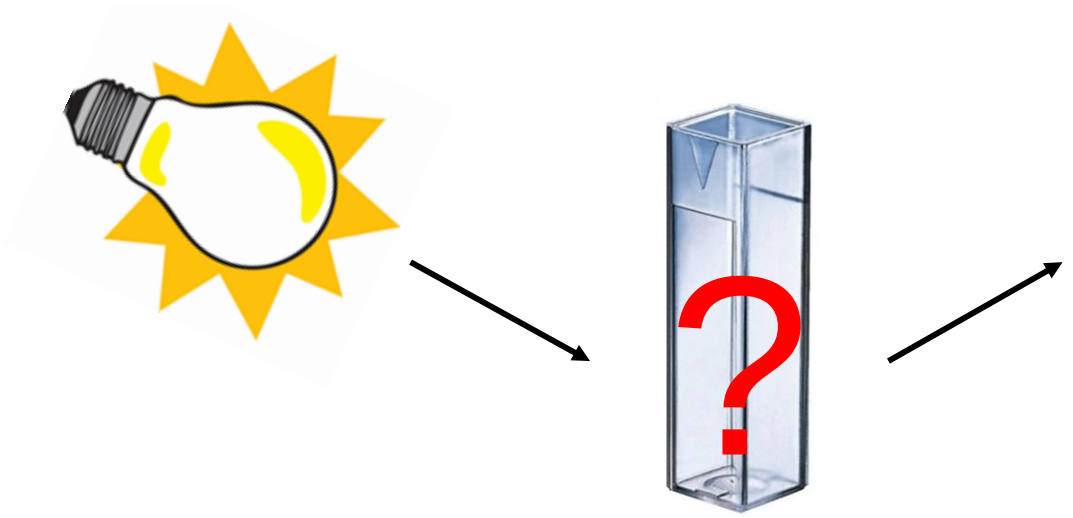
Objective

Verify if AOPs (Fenton and photo-Fenton) are more efficient than conventional whitening methods (HP or HP + light).

Spectrophotometry



http://gg.gg/e3pyv



Absorbance = 1,...

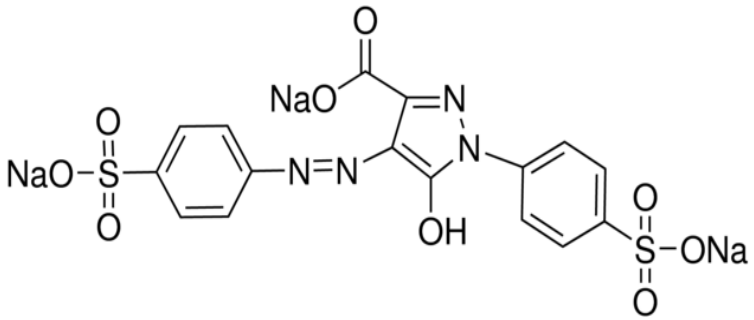
Methods

http://dx.doi.org/10.1590/1678-775720130578

Effect of coffee and a cola-based soft drink on the color stability of bleached bovine incisors considering the time elapsed after bleaching

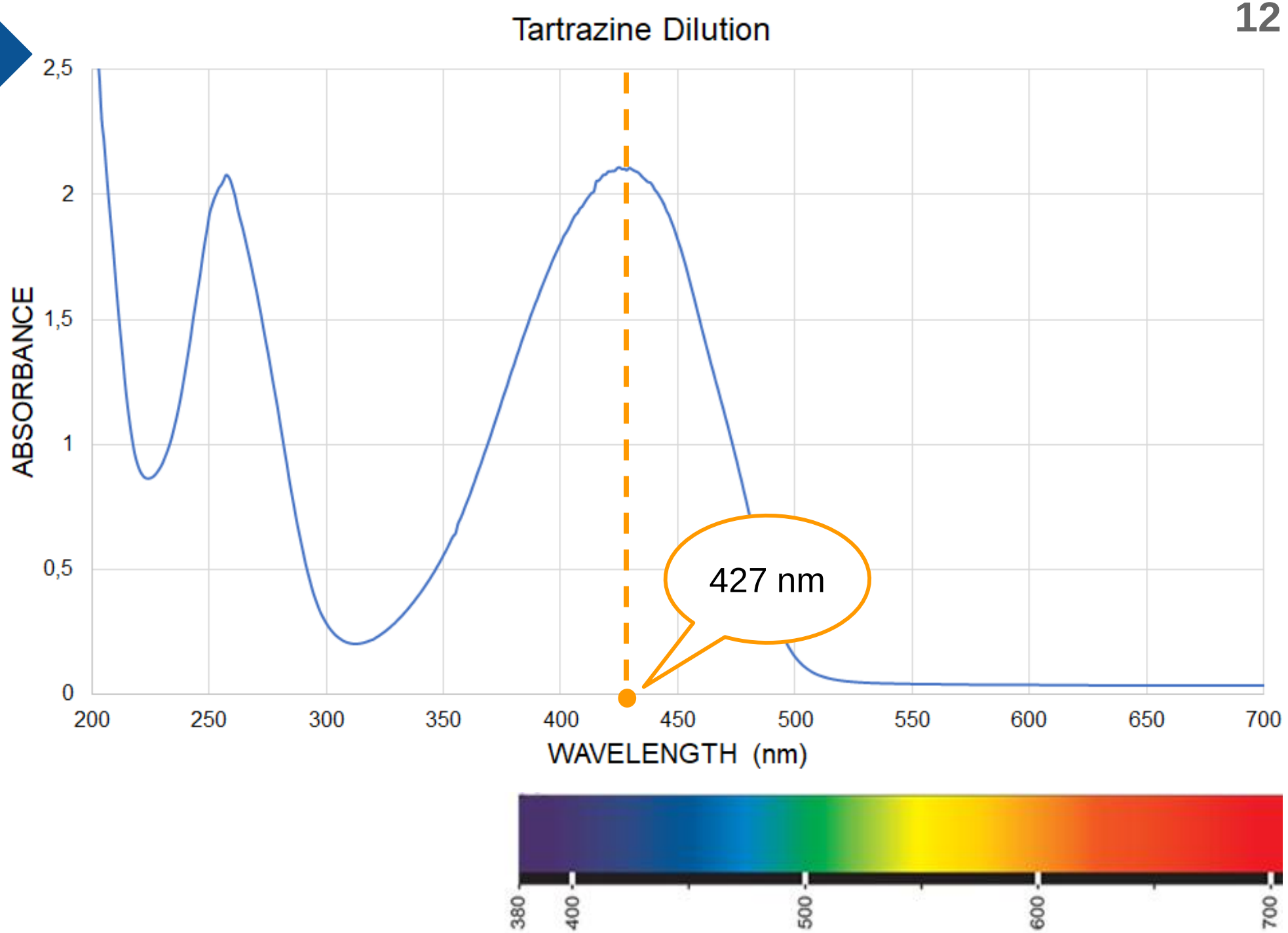
Rodrigo PIROLO[1], Rafael Francisco Lia MONDELLI[2], Gisele Maria CORRER[3], Carla Castiglia GONZAGA[3], Adilson Yoshio FURUSE[2]

Journal of Applied Oral Science. May 2014.

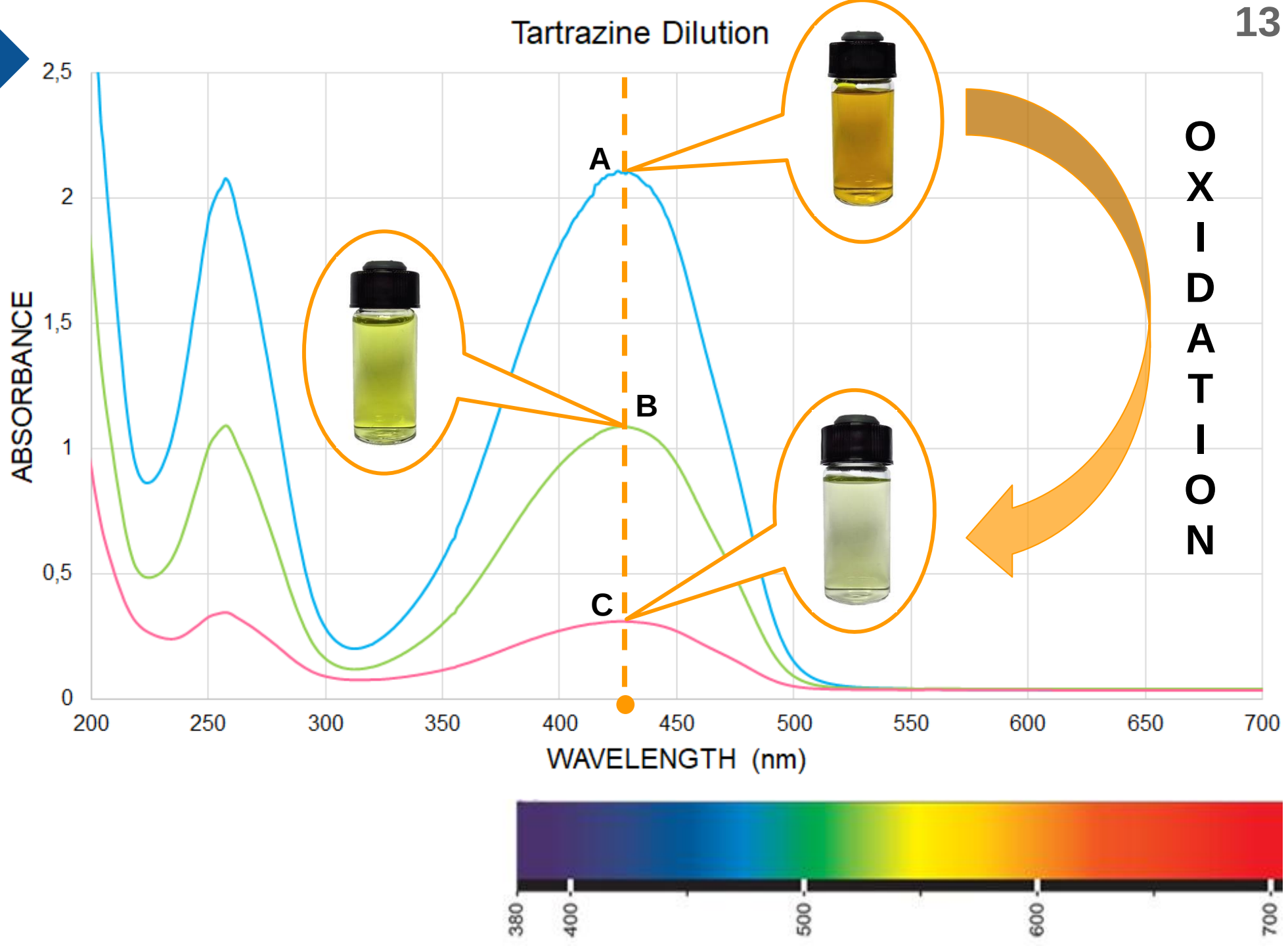
Name	Structural formula	Molecular weight (g/mol)	Absorbance (nm)
Tartrazine		534,3	427

Sigma-Aldrich (available at http://gg.gg/dt89y)

Methods


Tartrazine Dilution
ABSORBANCE
2,5
2
1,5
1
0,5
0
200
250
300
350
400
450
500
550
600
650
700
WAVELENGTH (nm)
427 nm
380
400
500
600
700

Methods


Tartrazine Dilution
ABSORBANCE
2,5
2
1,5
1
0,5
0
200
250
300
350
400
450
500
550
600
650
700
WAVELENGTH (nm)
A
B
C
OXIDATION
380
400
500
600
700

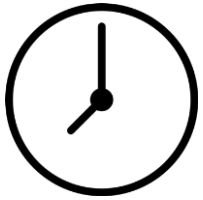
Methods

OXIDANT	OXIDANT CONCENTRATION	LIGHT PRESENCE		IRON PRESENCE	
HP	40%	Present ✓	Absent X	Present ✓	Absent X
	25%				
	5%				

Methods

Experimental Groups

	Group	HP	Light	Iron
HP	HP 40%	[40]	X	X
	HP 25%	[25]	X	X
	HP 5%	[5]	X	X
HP + Light	HP 40% + Light	[40]	✓	X
	HP 25% + Light	[25]	✓	X
	HP 5% + Light	[5]	✓	X
HP + Iron	HP 40% + Fe	[40]	X	✓
	HP 25% + Fe	[25]	X	✓
	HP 5% + Fe	[5]	X	✓
HP + Light + Iron	HP 40% + Light + Fe	[40]	✓	✓
	HP 25 + Light + Fe	[25]	✓	✓
	HP 5% + Light + Fe	[5]	✓	✓



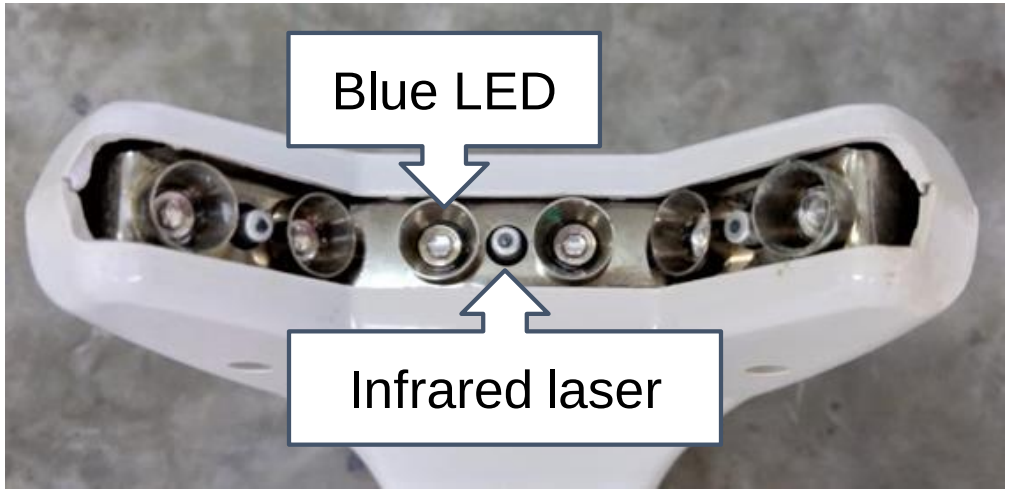
Baseline

15 min

30 min

45 min

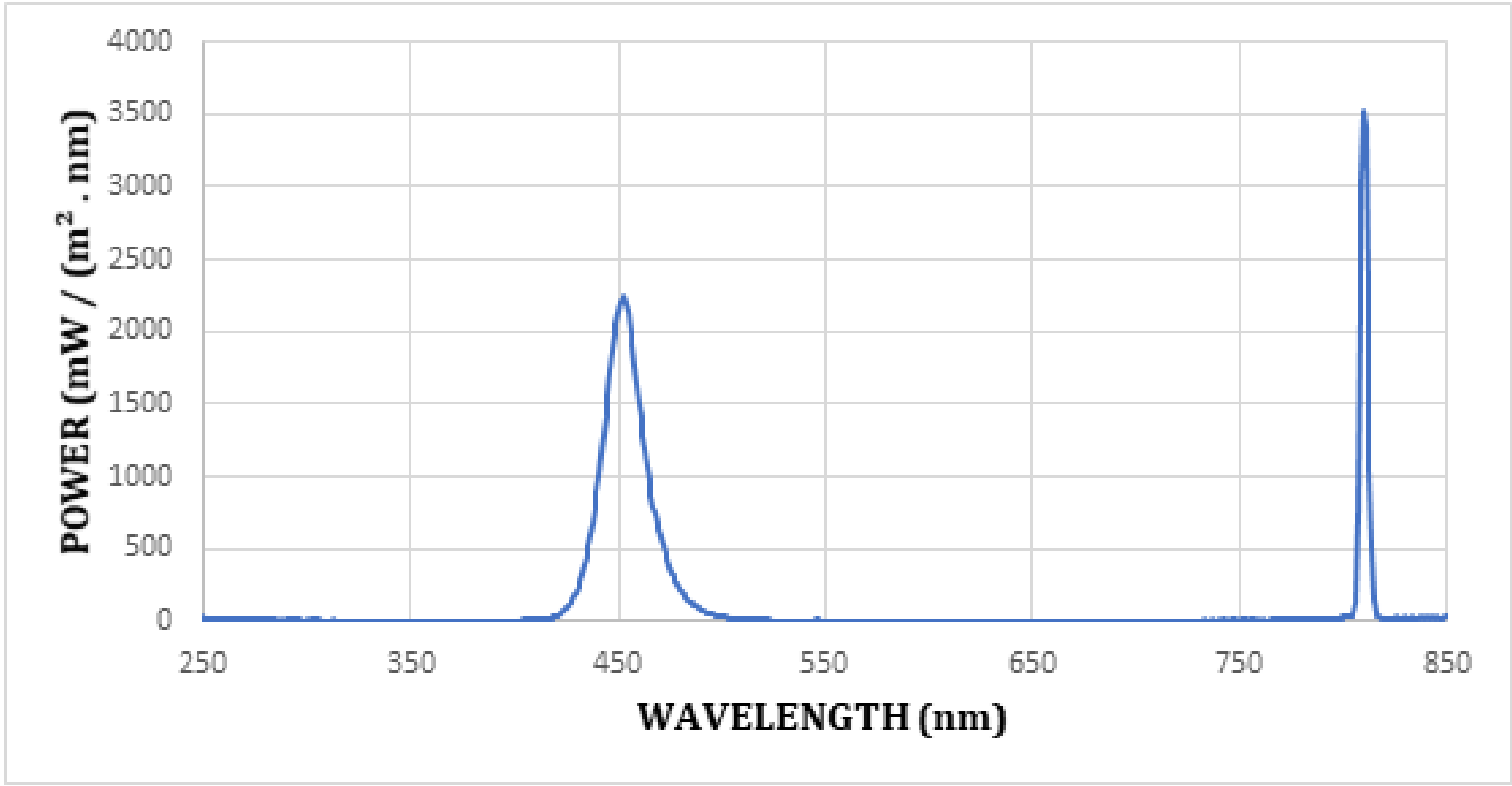
Methods

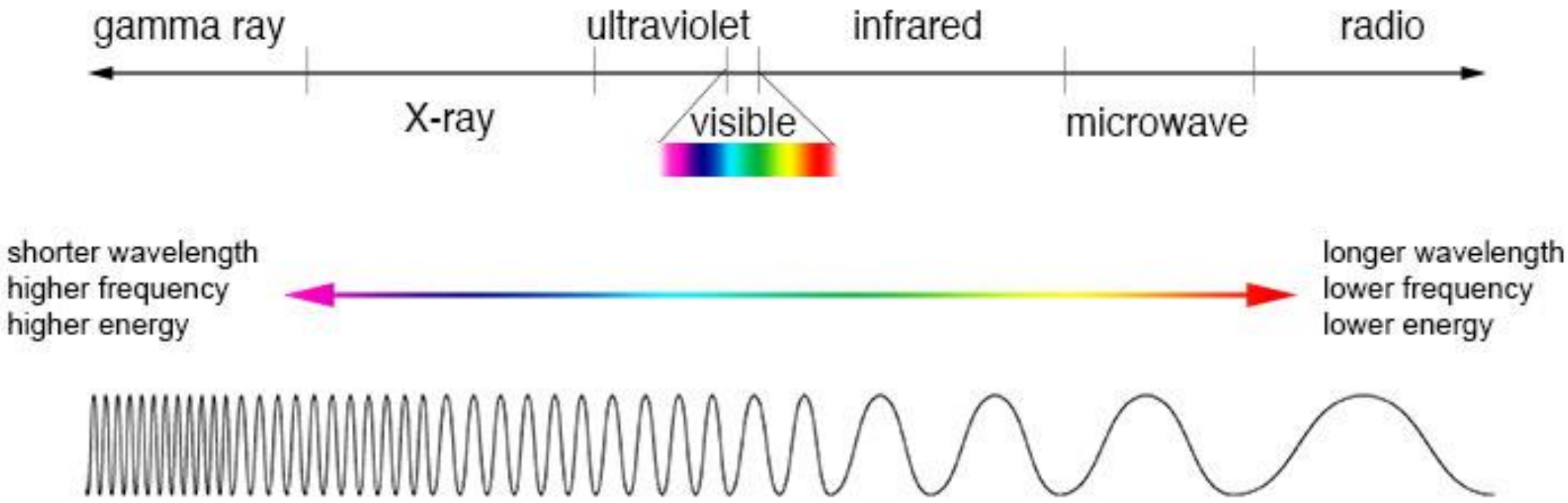


Results

97.3 °F (36.3 °C)

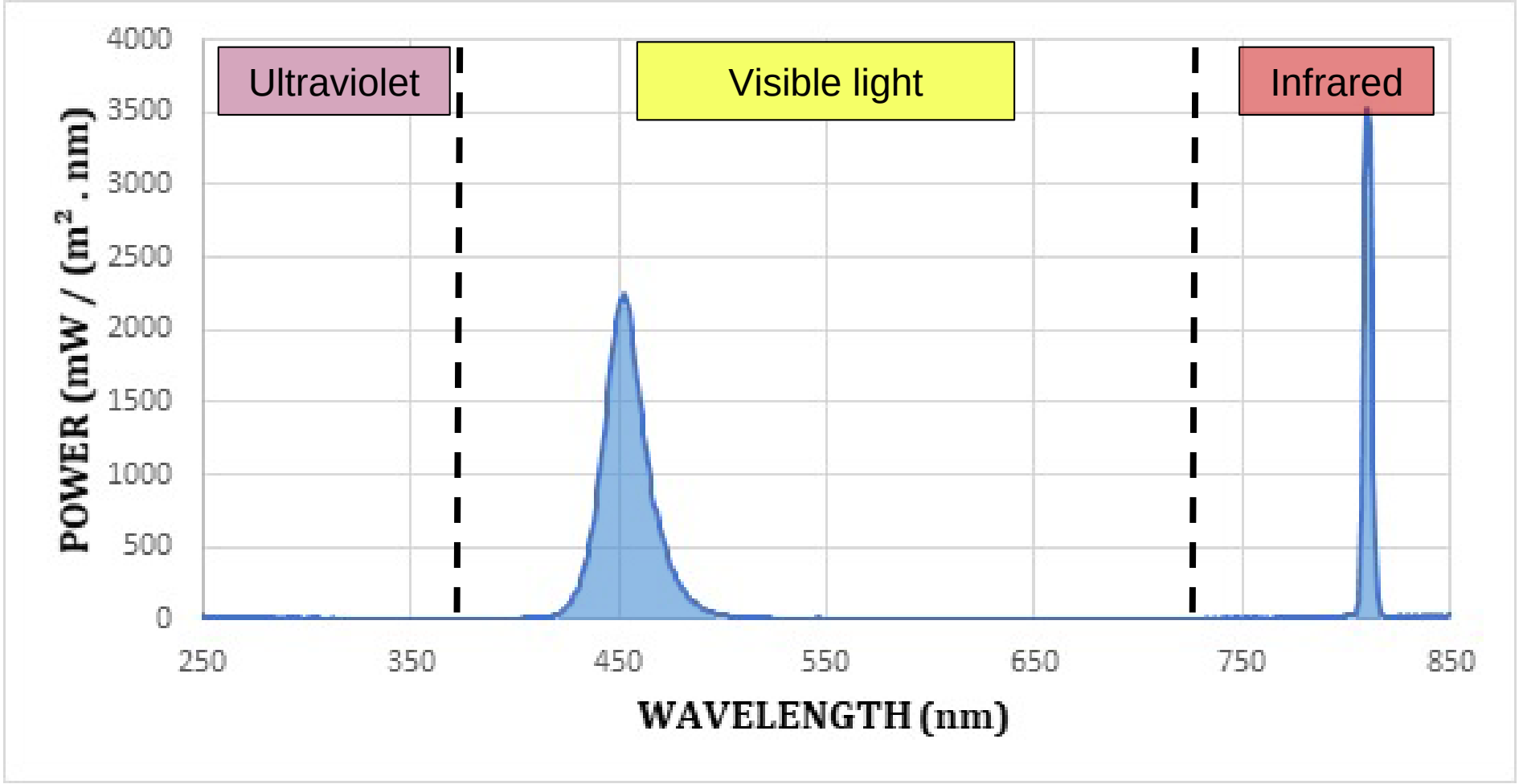
Results


4000
3500
3000
2500
2000
1500
1000
500
0
POWER (mW / (m^2 . nm)
250
350
450
550
650
750
850
WAVELENGTH (nm)



http://gg.gg/dt96v

Results

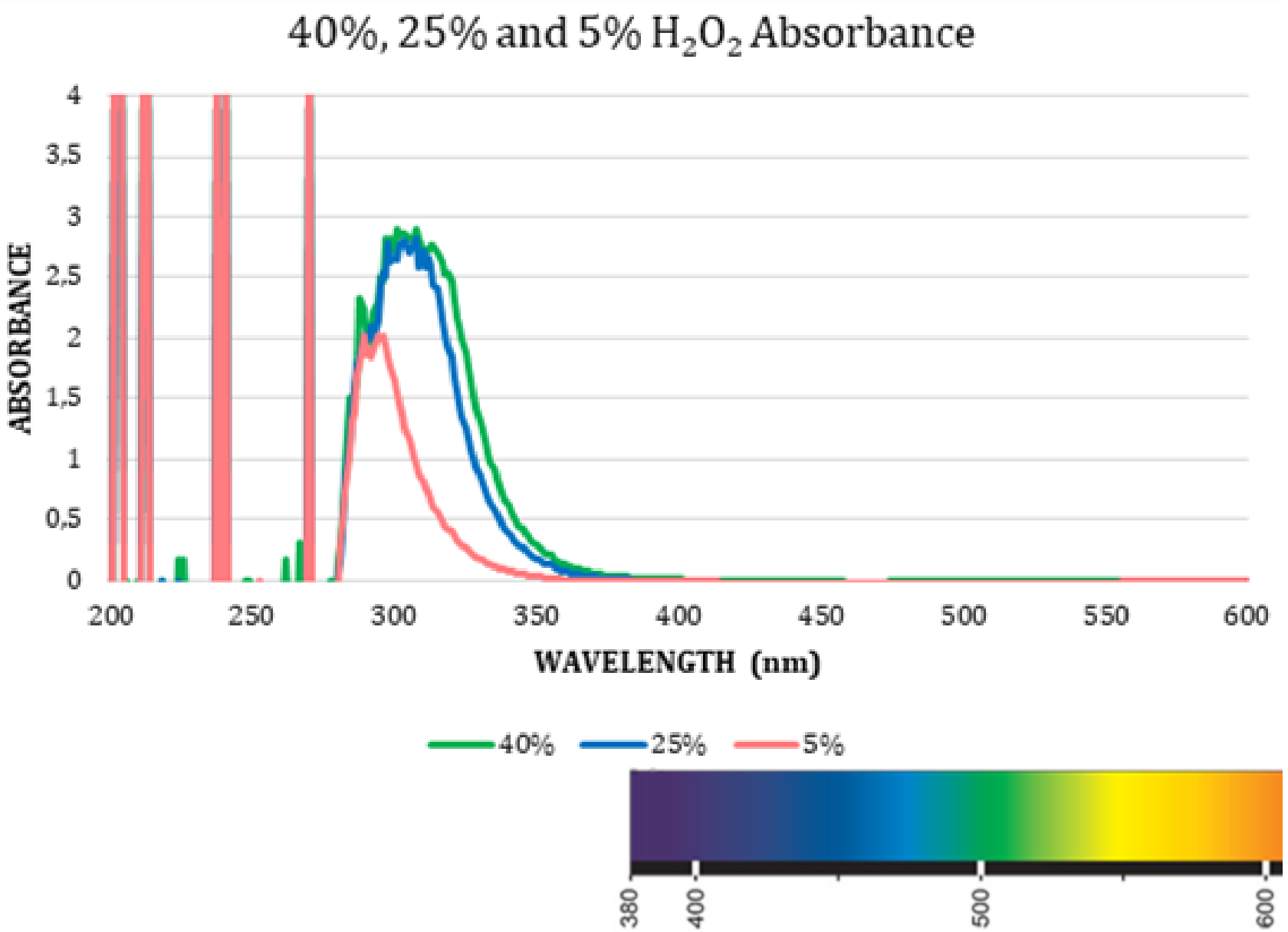


Light Spectrum	Wavelength	Power (mW/cm²)
Visible light	400 nm < λ < 750 nm	5,92485
Infrared	λ > 750 nm	1,86708
Ultraviolet	λ < 400 nm	0,16811

3x

≅0

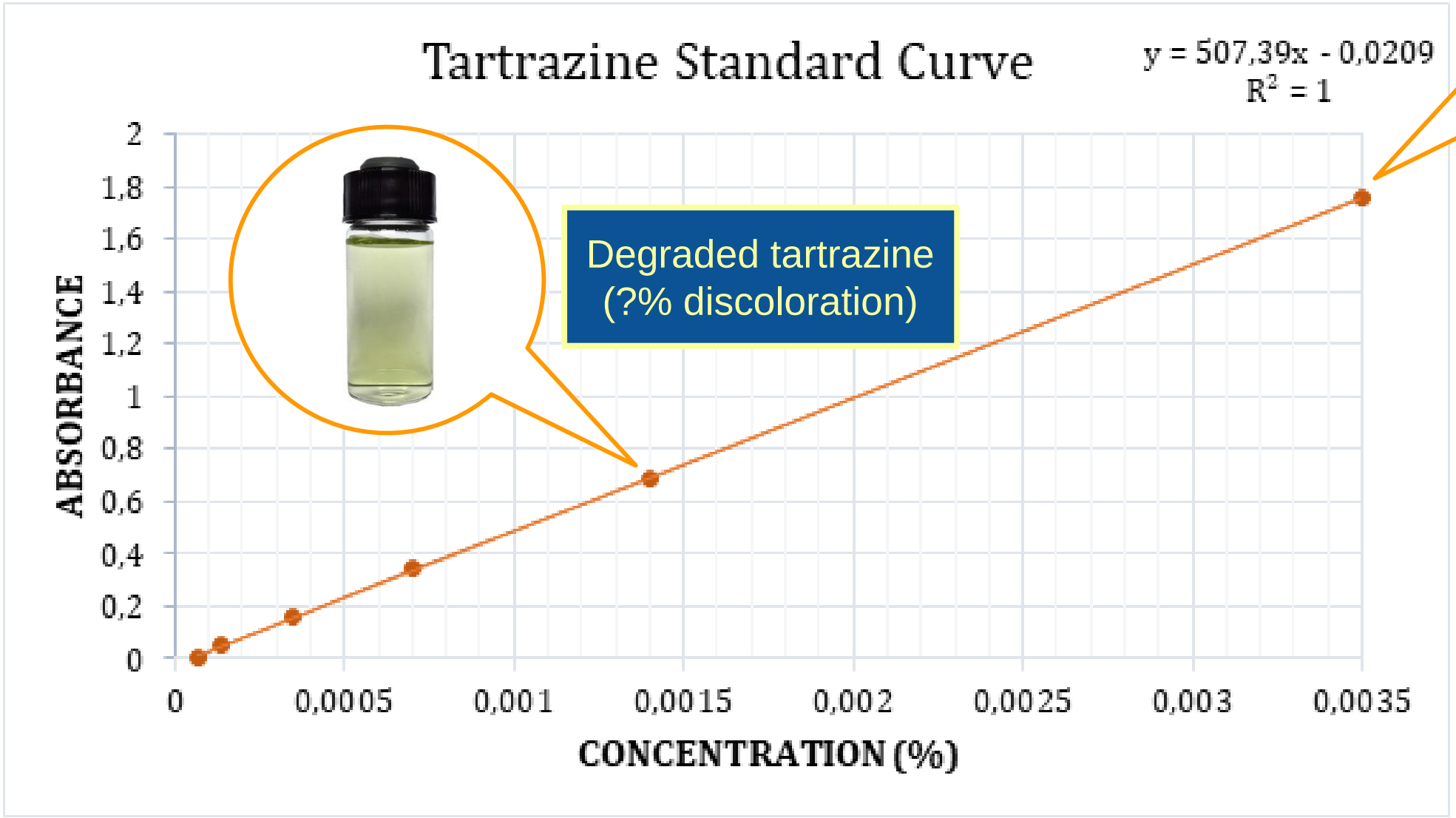
Results



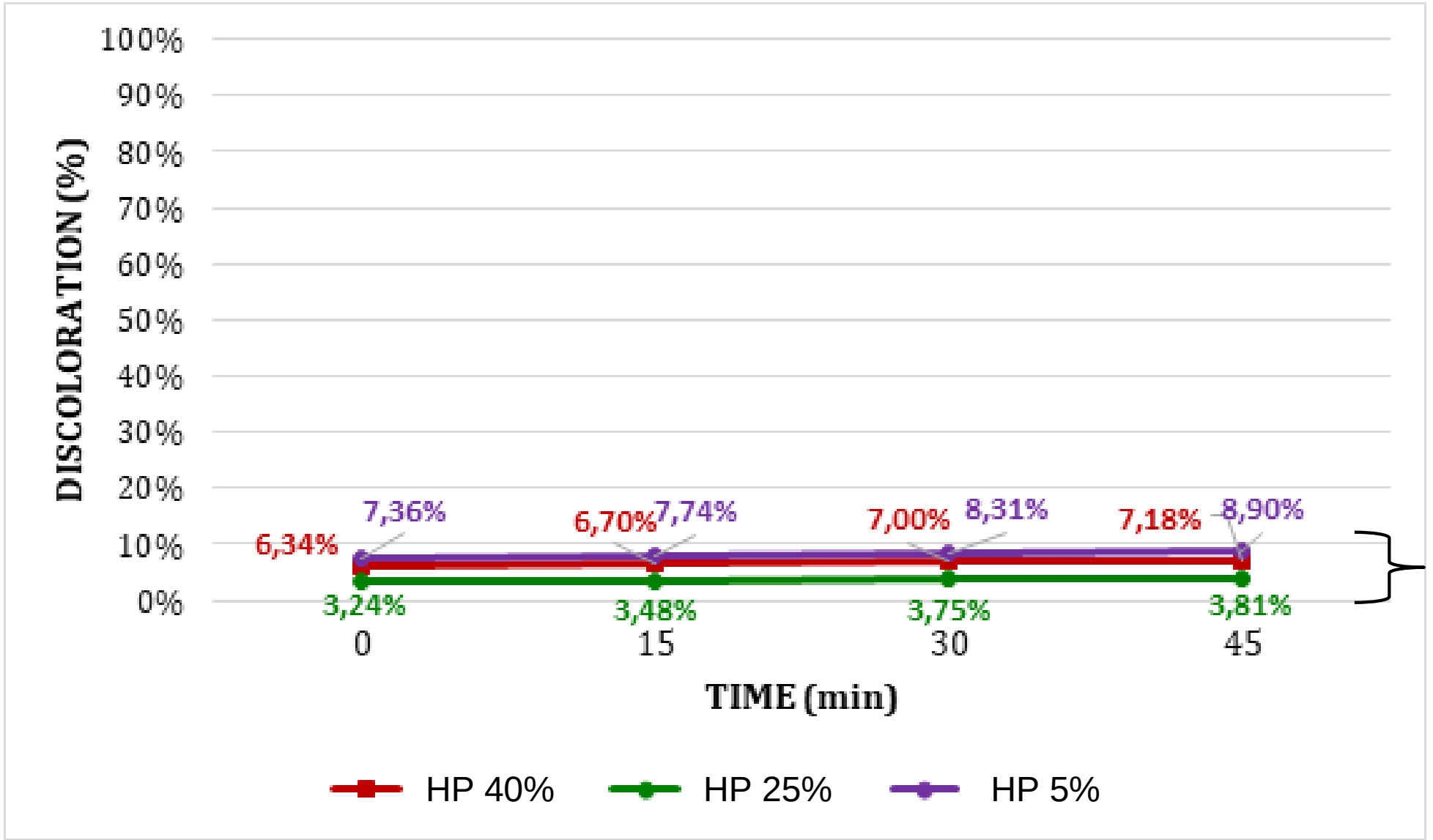
GROTTHUS-DRAPER LAW

"Only that light which is **absorbed** by a system can bring about a photochemical change"

Results

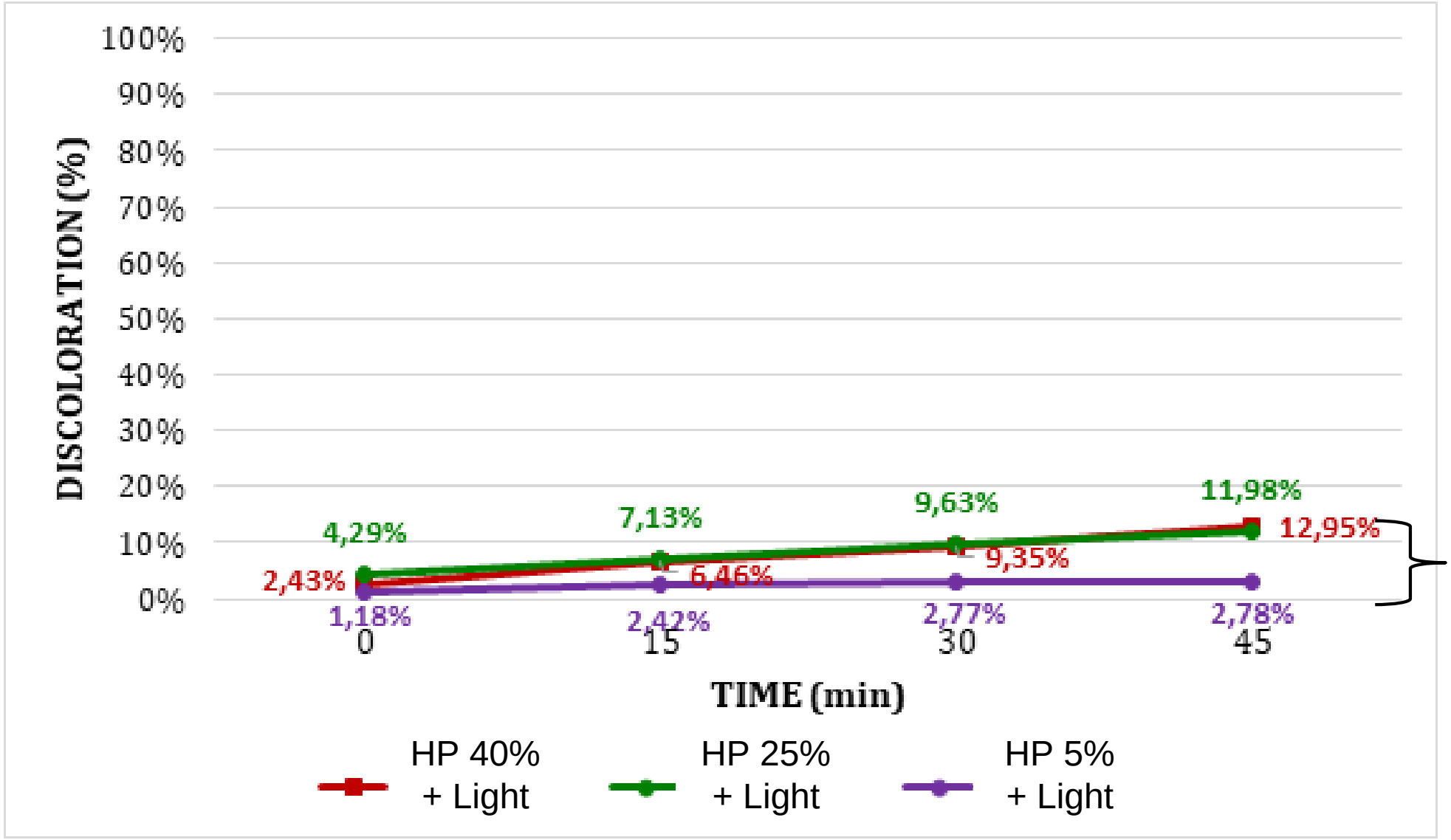

Tartrazine Standard Curve
y = 507,39x - 0,0209
R² = 1
ABSORBANCE
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
0,0005
0,001
0,0015
0,002
0,0025
0,003
0,0035
CONCENTRATION (%)
Degraded tartrazine
(?% discoloration)
Pure tartrazine
(0% discoloration)

Results



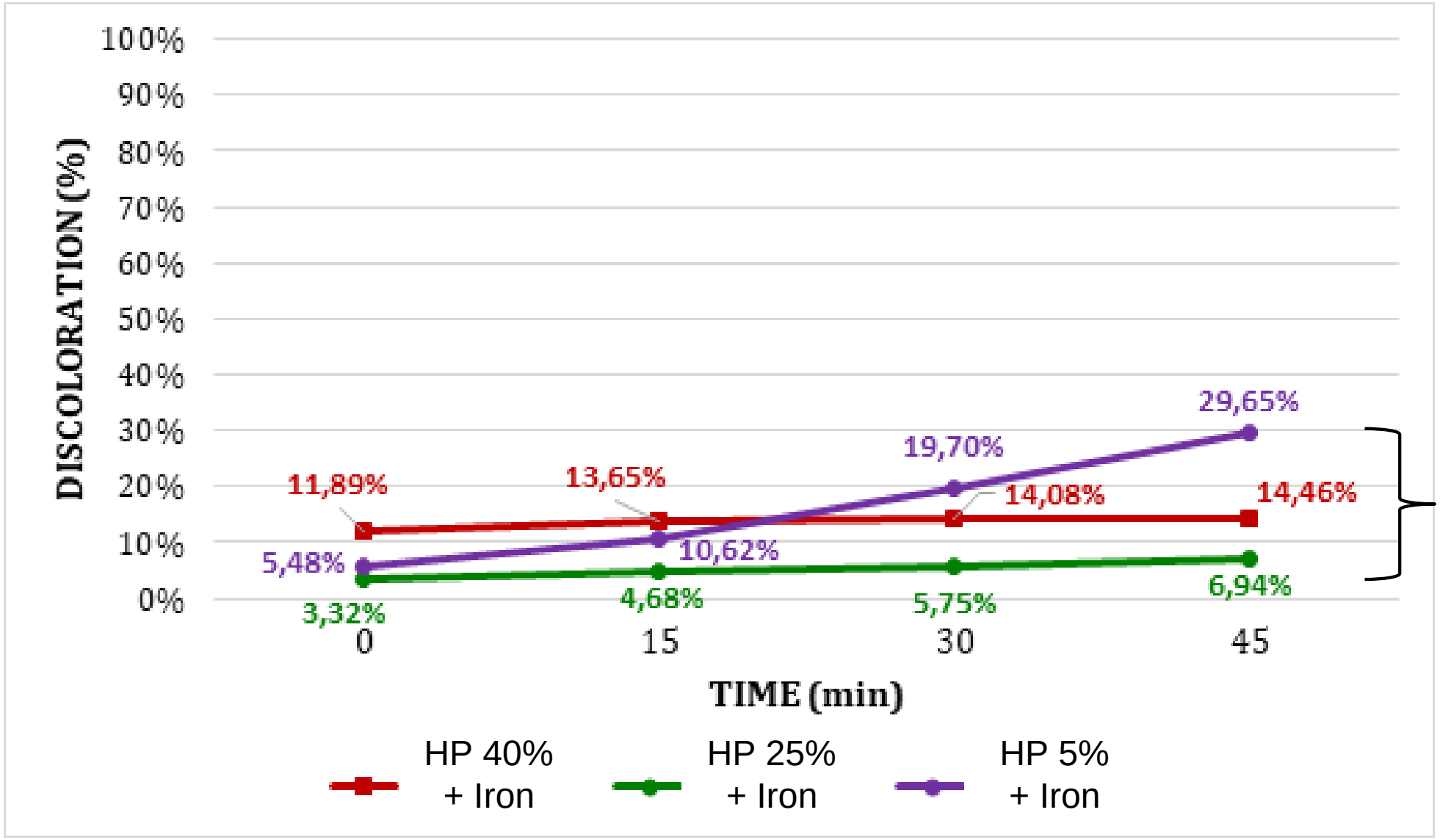
HP only

Results



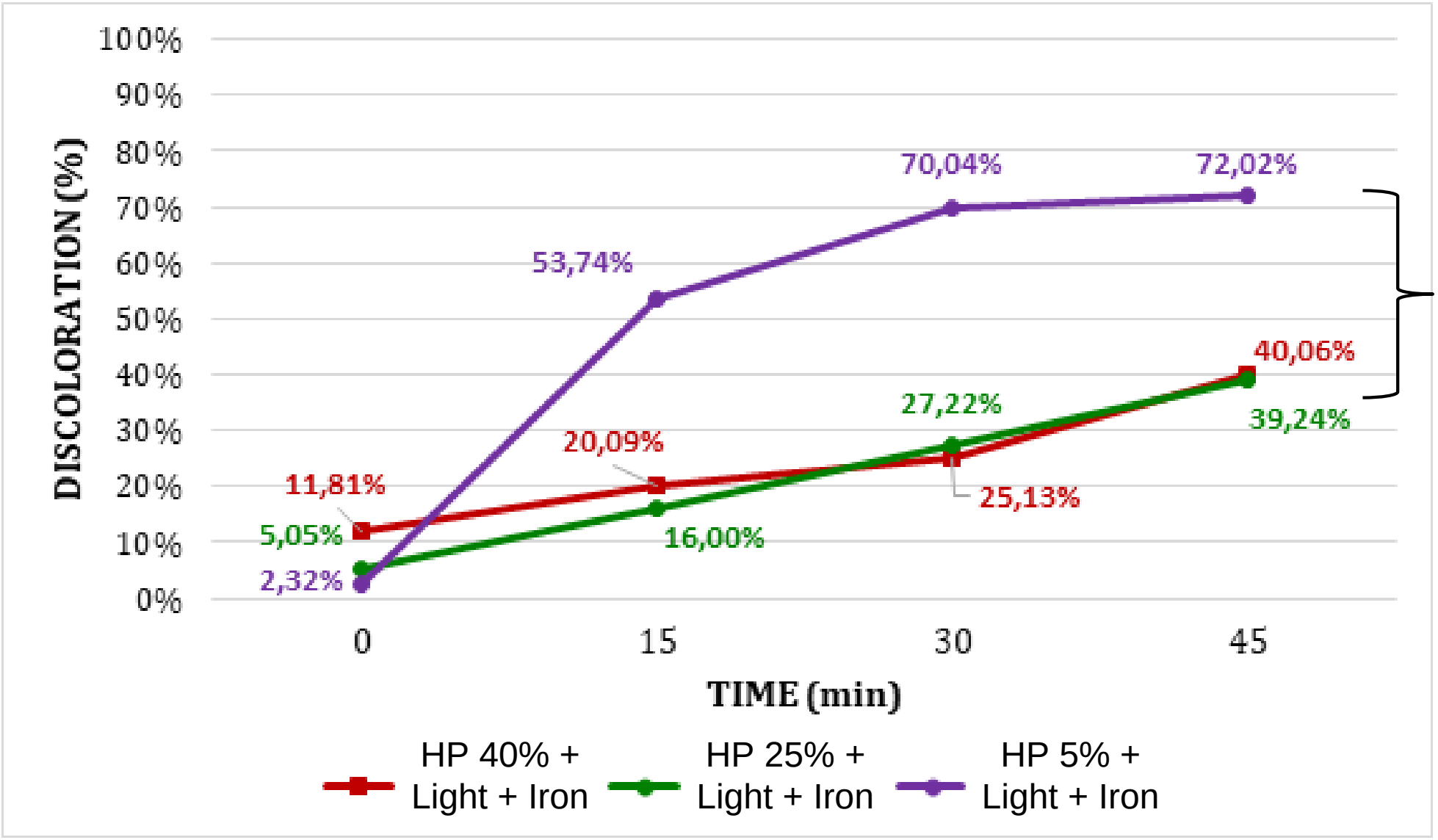
HP + Light

Results



HP + Iron

Results

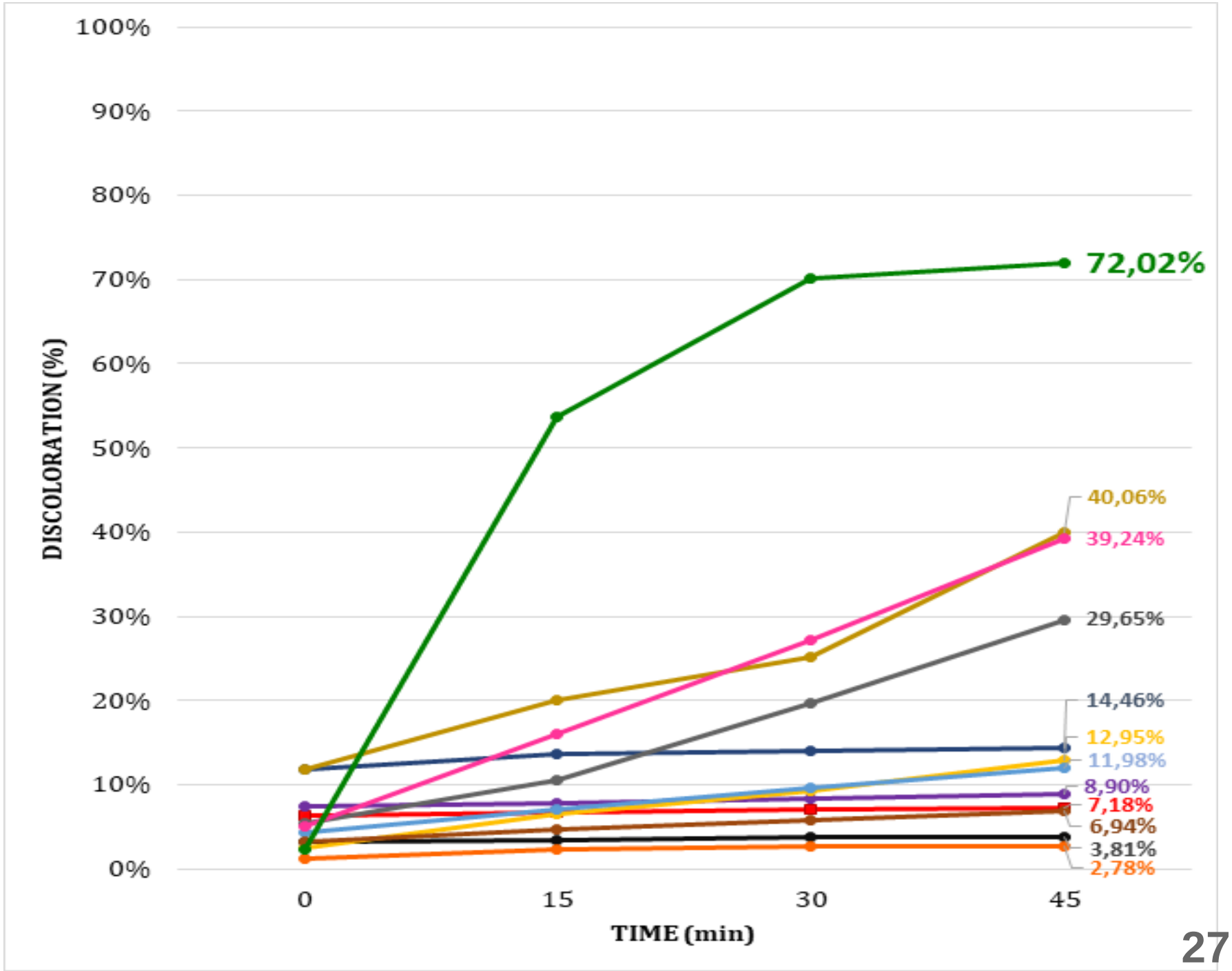


HP + Light + Iron

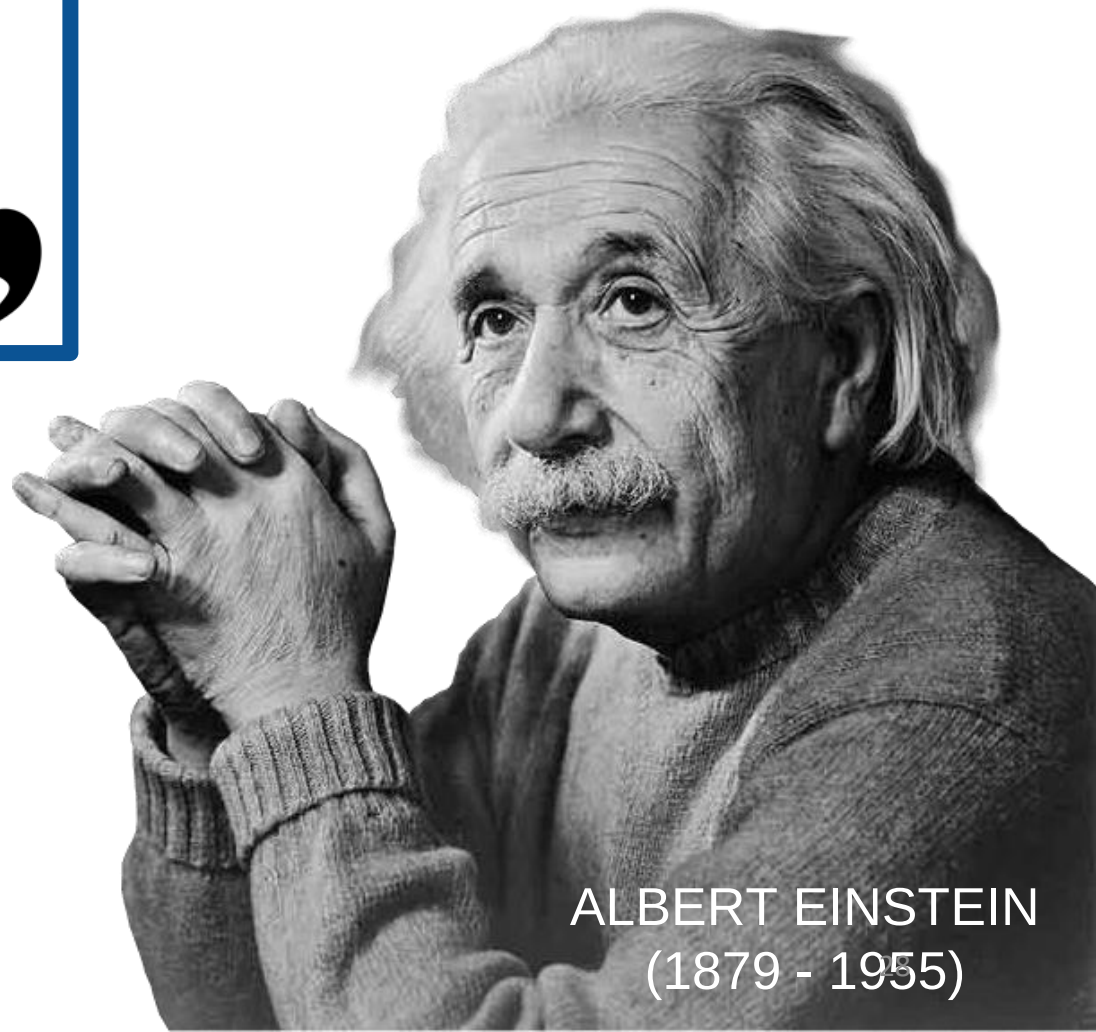
Conclusion

5% HP + Light + Iron
(72% discoloration)

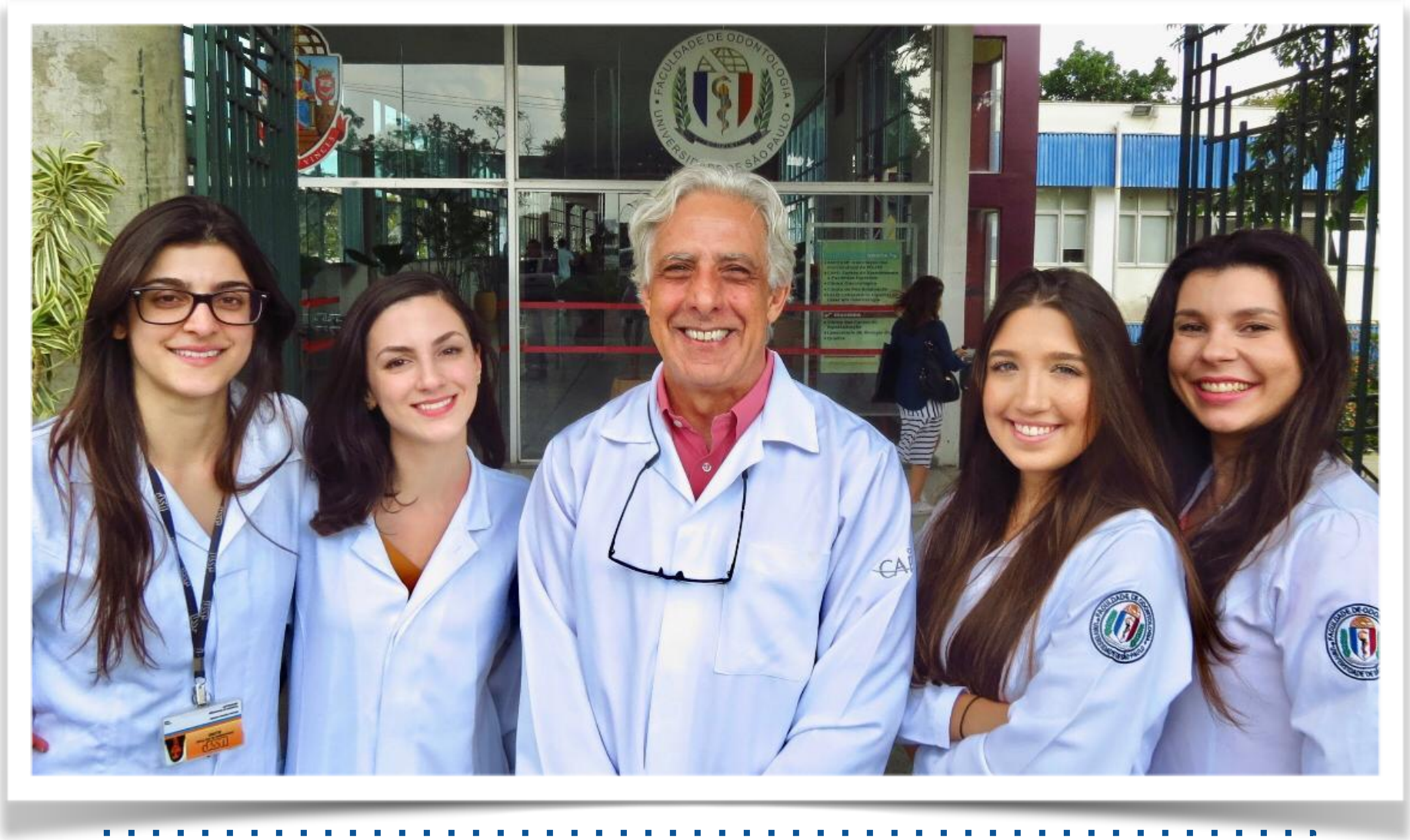
Pure tartrazine
(0% discoloration)



> Insanity:
> doing the same thing over and over again and expecting different results.



ALBERT EINSTEIN
(1879 - 1955)



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