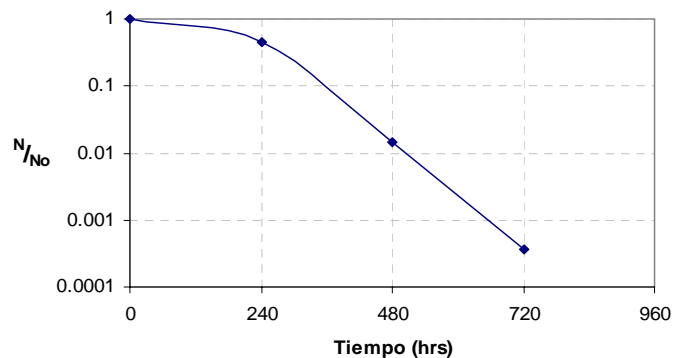


## APÉNDICE 1: Memoria de Cálculo de Experimentos de Desinfección.

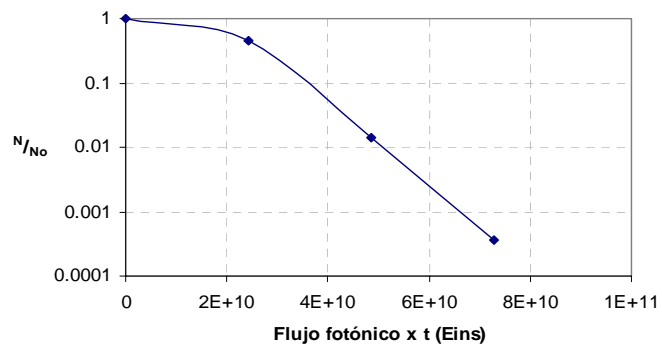
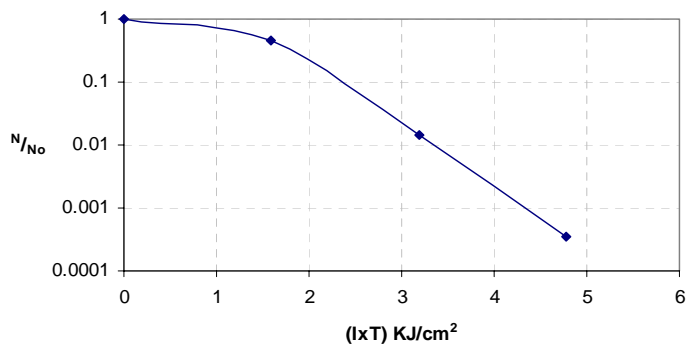
Inactivación de esporas de *Bacillus subtilis* con radiación solar artificial SIN catalizador de ningún tipo.

Muestra \ Disolución	0	-1	-2	-3	-4	-5	Total (ufc)	N/No	N/No (%)	Intensidad W/m <sup>2</sup>
08:30	2800000	280000	28000	2800	280		2800000	1	100.00%	1063
12:30	1280000	128000	12800	1280	128		1280000	0.457142857	45.71%	1124
16:30	40000	4000	400	40	4		40000	0.014285714	1.43%	1164
20:30	1000	100	10	1			10000	0.000357143	0.04%	<b>1117</b>
00:30	0	0	0	0			0	0	0.00%	1124
08:30	0	0	0	0			0	0	0.00%	1053

**Promedio: 1107.5**



IxT (KJ/cm <sup>2</sup> )	Tiempo (min)	N/No	FexT (Eins)	Fe (Eins/s)
0	0	1	0	<b>1686000</b>
1.5948	240	0.457142857	2.42E+10	
3.1896	480	0.014285714	4.85E+10	
4.7844	720	0.000357143	7.28E+10	
6.3792	960	0	9.71E+10	
9.5688	1440	0	1.45E+11	

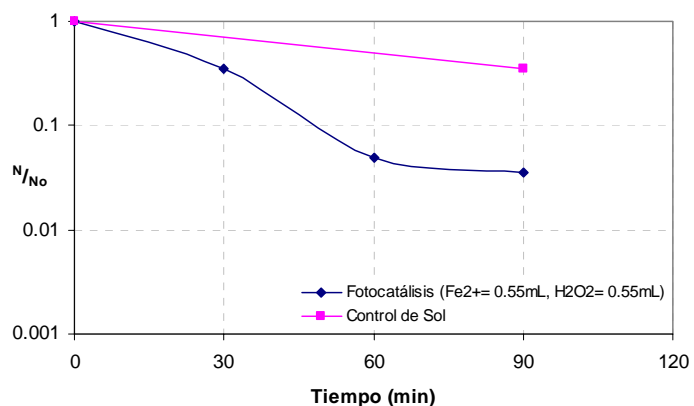


**Condiciones:**

Agua destilada  
0.1ml Esporas *B. subtilis*  
Simulador Solar  
20°C

Inactivación de esporas de *Bacillus subtilis* con fotocátalisis solar (◆) y con radiación solar natural solamente (■)

Muestra \ Disolución	0	-1	-2	-3	-4	-5	Total (ufc)	N/No	N/No (%)
<b>Control de Sombra</b>	2000000	200000	20000	2000	200	20	20000000	1	100.00%
<b>Control de Sol</b>	700000	70000	7000	700	70	7	7000000	0.35	35.00%
<b>30'</b>	700000	70000	7000	700	70	7	7000000	0.35	35.00%
<b>60'</b>	100000	10000	1000	100	10		1000000	0.05	5.00%
<b>90'</b>	72000	7200	720	72			720000	0.036	3.60%

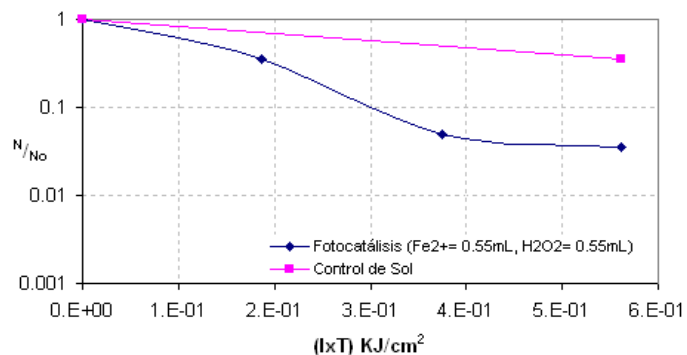


Intensidad W/m <sup>2</sup>	IxT (KJ/cm <sup>2</sup> )	Tiempo (min)	N/No
1039	0	0	1
1053.3	0.1873908	30	0.35
1037.6	0.3747816	60	0.05
1017.8	0.5621724	90	0.036
1017.8	0.5621724	90	0.35

**1041.06**

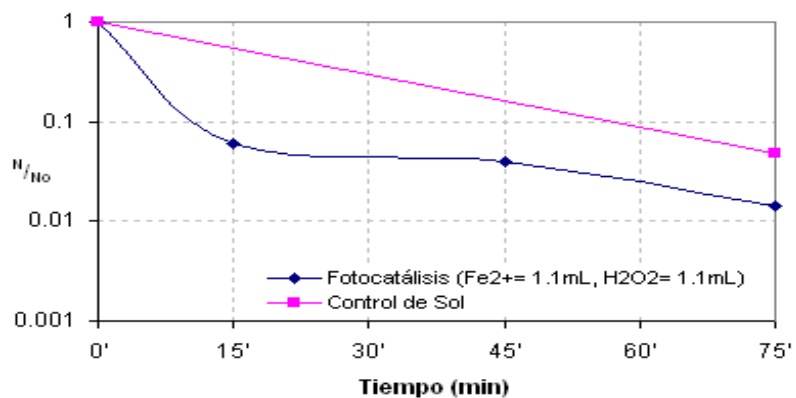
**Condiciones:**

Agua Destilada  
 0.55ml Fe 25mM  
 0.55ml. H<sub>2</sub>O<sub>2</sub> 1000mM  
 0.10ml. Esporas *B. subtilis*  
 Canal Parabólico

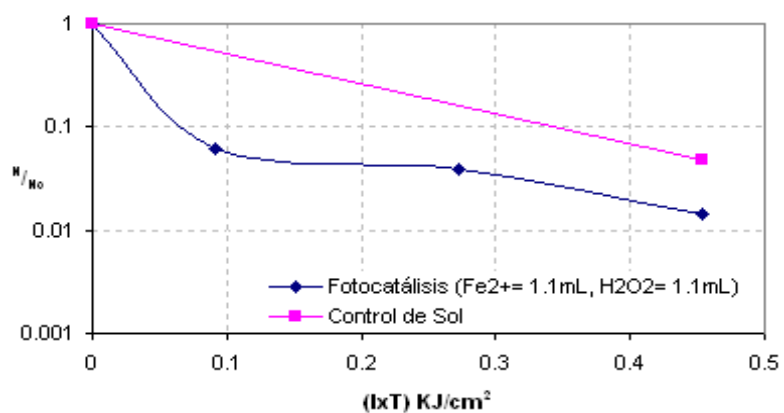


Inactivación de esporas de *Bacillus subtilis* con fotocátalisis solar (◆) y con radiación solar natural solamente (■)

Disolución Tiempo	0	-1	-2	-3	-4	-5	Total (ufc)	N/No	N/No (%)
<b>Control de Sombra</b>	16400000	1640000	164000	16400	1640	164	16400000	1	100.00%
<b>Control de Sol</b>	800000	80000	8000	800	80	8	800000	0.048780488	4.88%
15'	1000000	100000	10000	1000	100	10	1000000	0.06097561	6.10%
45'	640000	64000	6400	640	64		640000	0.03902439	3.90%
75'	236000	23600	2360	236			236000	0.014390244	1.44%



Intensidad (W/m <sup>2</sup> )	IxT (KJ/cm <sup>2</sup> )	Tiempo (min)	N/No
<b>1007.91</b>	0	0'	1
	0.0907119	15'	0.0609756
	0.2721357	45'	0.0390244
	0.4535595	75'	0.0143902
	0.4535595	75'	0.04878

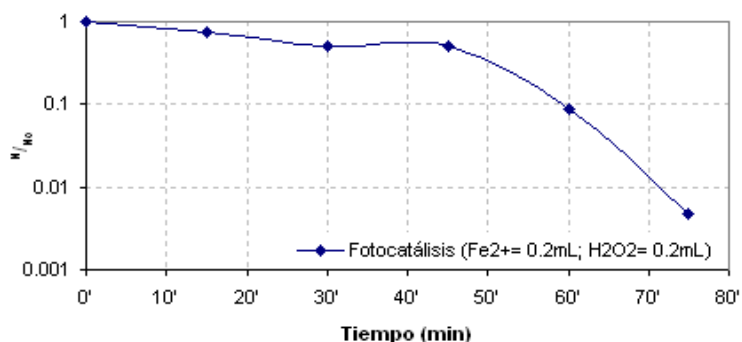


**Condiciones:**

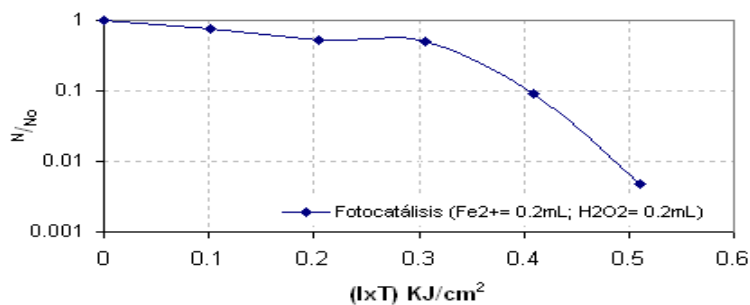
Agua Destilada  
 1.1ml Fe 25mM  
 1.1ml H<sub>2</sub>O<sub>2</sub> 1000mM  
 0.1ml Esporas *B. subtilis*  
 Canal Parabólico

### Inactivación de esporas de *Bacillus subtilis* con fotocatalisis solar

Disolución \ Tiempo	0	-1	-2	-3	-4	-5	Total (ufc)	$N/N_0$	$N/N_0$ (%)	IxT (KJ/cm <sup>2</sup> )
0'	78400000	7840000	784000	78400	7840	784	78400000	1	100.00%	0
15'	59480000	5948000	594800	59480	5948	594	59480000	0.758673469	75.87%	0.10224
30'	40320000	4032000	403200	40320	4032	403	40320000	0.514285714	51.43%	0.20448
45'	39580000	3958000	395800	39580	3958	395	39580000	0.504846939	50.48%	0.30672
60'	7000000	700000	70000	7000	700	70	7000000	0.089285714	8.93%	0.40896
75'	370000	37000	3700	370	37	3	370000	0.004719388	0.47%	0.5112



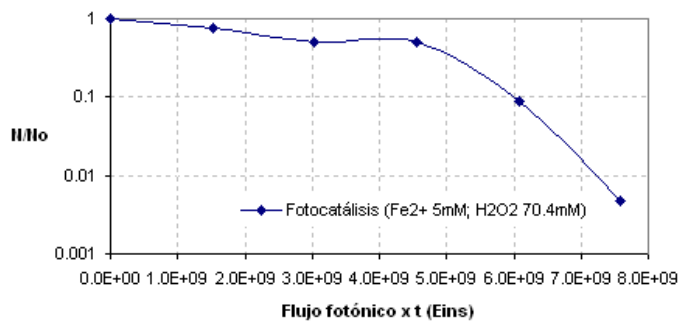
Tiempo (min)	$N/N_0$	Flujo Fotónico x t	Fe (Eins/s)
0'	1	0	<b>1686000</b>
15'	0.758673469	1517400000	
30'	0.514285714	3034800000	
45'	0.504846939	4552200000	
60'	0.089285714	6069600000	
75'	0.004719388	7587000000	



Intensidad (W/m<sup>2</sup>)  
Promedio **1136.00**

Condiciones:

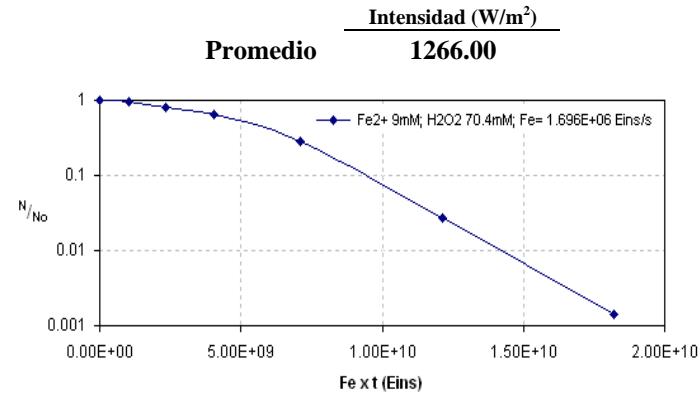
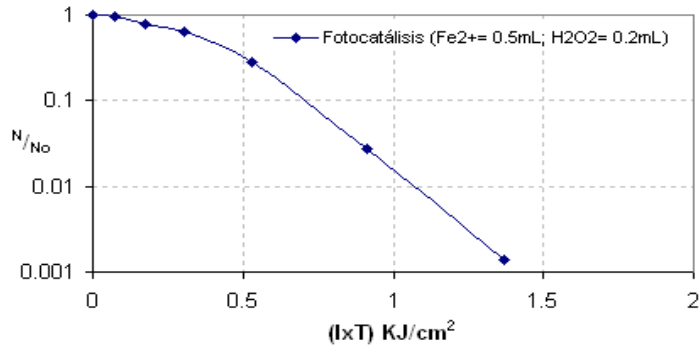
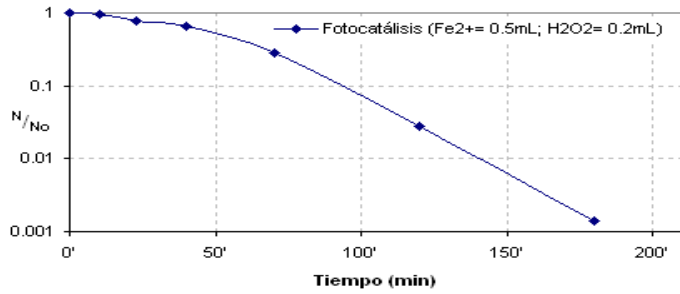
Agua Destilada  
0.2ml Fe 25mM  
0.2ml H<sub>2</sub>O<sub>2</sub> 352mM  
0.182ml Esporas *B. subtilis*  
Simulador Solar



### Inactivación de esporas de *Bacillus subtilis* con fotocatalisis solar

Disolución Tiempo	0	-1	-2	-3	-4	-5	Total (ufc)	$N/N_0$	$N/N_0$ (%)
0'	44240000	4424000	442400	44240	4424		44240000	1	100.00%
10'	42560000	4256000	425600	42560	4256		42560000	0.962025316	96.20%
23'	35000000	3500000	350000	35000	3500		35000000	0.791139241	79.11%
40'	28560000	2856000	285600	28560	2856		28560000	0.64556962	64.56%
70'	12320000	1232000	123200	12320	1232		12320000	0.278481013	27.85%
120'	1210000	121000	12100	1210	121		1210000	0.027350814	2.74%
180'	60000	6000	600	60	6		60000	0.001409774	0.14%
240'	0	0	0	0	0		0	0	0.00%

$I \times T$ (KJ/cm <sup>2</sup> )	Tiempo (min)	$N/N_0$	$Fe \times t$	$Fe$ (Eins/s)
0	0'	1	0	<b>1686000</b>
0.07596	10'	0.962025316	1011600000	
0.174708	23'	0.791139241	2326680000	
0.30384	40'	0.64556962	4046400000	
0.53172	70'	0.278481013	7081200000	
0.91152	120'	0.027350814	12139200000	
1.36728	180'	0.001409774	18208800000	
1.82304	240'	0	24278400000	

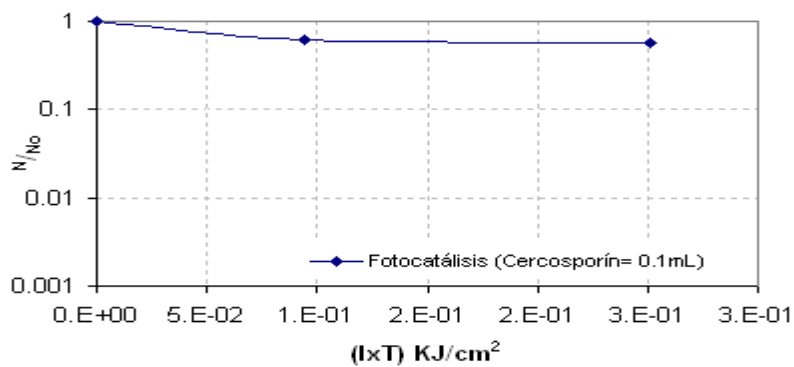
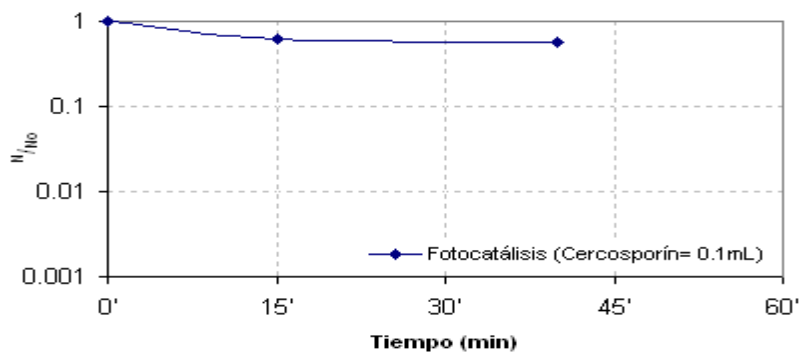


#### Condiciones:

Agua Destilada  
0.5ml Fe 18mM  
0.2ml H<sub>2</sub>O<sub>2</sub> 352mM  
0.1ml Esporas *B. subtilis*  
Simulador Solar

Inactivación de esporas de *Bacillus subtilis* con fotocatalisis solar utilizando cercosporin

Muestra \ Disolución	0	-1	-2	-3	-4	-5	Total (ufc)	N/No	N/No (%)
0'	135800000	13580000	1358000	135800	13580	1358	135800000	1	100.00%
15'	84560000	8456000	845600	84560	8456		84560000	0.6227	62.27%
40'	78130000	7813000	781300	78130	7813		78130000	0.5753	57.53%



W= 1045 W/m2

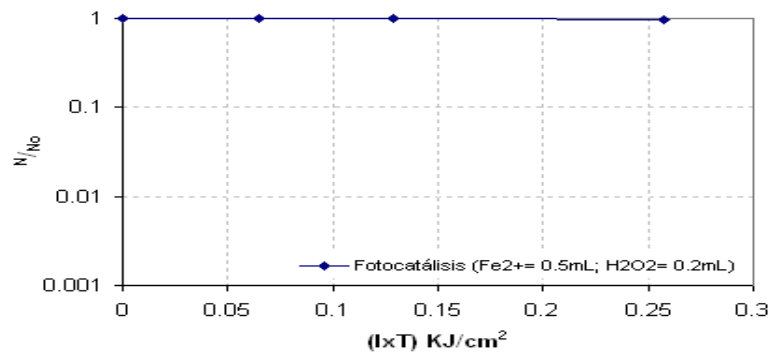
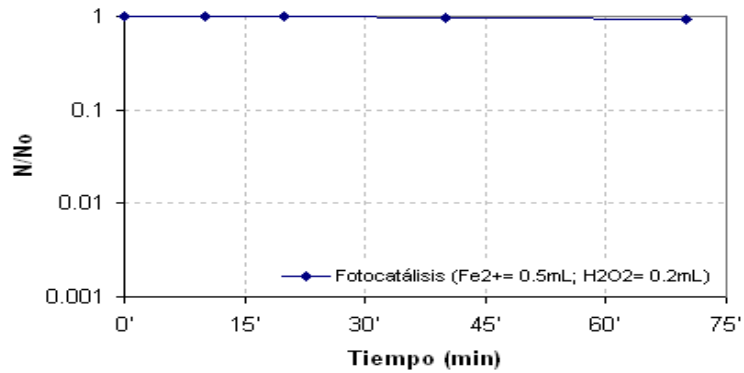
IxT (KJ/cm²)	Tiempo	N/No
0	0'	1
0.09405	15'	0.6227
0.2508	40'	0.5753

**Condiciones:**

Agua Destilada  
 0.1ml Cercosporin  
 1.0ml Esporas *B. subtilis*  
 Simulador Solar

Inactivación de esporas de *Bacillus subtilis* con fotocatalisis solar utilizando solución buffer fosfato pH 6.0

Muestra \ Disolución	0	-1	-2	-3	-4	-5	Total (ufc)	N/No	N/No (%)
0'	38808000	3880800	388080	38808			38808000	1	100.00%
10'	38808000	3880800	388080	38808			38808000	1	100.00%
20'	38304000	3830400	383040	38304			38304000	0.987012987	98.70%
40'	37296000	3729600	372960	37296			37296000	0.961038961	96.10%
70'	36288000	3628800	362880	36288			36288000	0.935064935	93.51%



IxT (KJ/cm <sup>2</sup> )	Tiempo (min)	N/No
0	0'	1
0.0644400	10'	1
0.1288800	20'	0.987012987
0.2577600	40'	0.961038961
0.4510800	70'	0.935064935

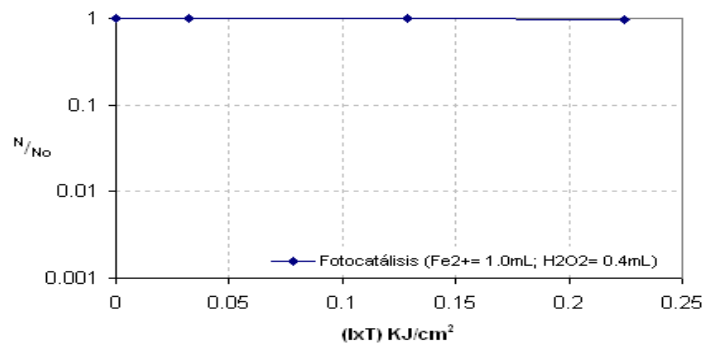
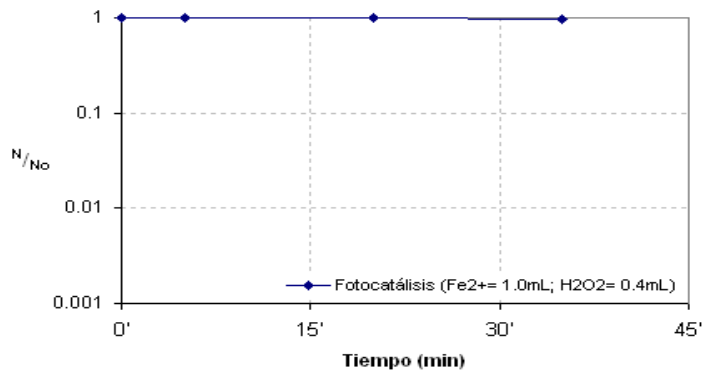
**Promedio** Intensidad (W/m<sup>2</sup>)  
**1074**

**Condiciones:**

Solución Búfer pH = 6.0  
0.5ml Fe 18mM  
0.2ml H<sub>2</sub>O<sub>2</sub> 1000mM  
1.0ml Esporas *B. subtilis*  
Simulador Solar

Inactivación de esporas de *Bacillus subtilis* con fotocatalisis solar utilizando solución buffer fosfato pH 6.0

Muestra \ Disolución	0	-1	-2	-3	-4	-5	Total (ufc)	N/No	N/No (%)
0'	37800000	3780000	378000	37800			378000000	1	100.00%
5'	37296000	3729600	372960	37296			372960000	0.986666667	98.67%
20'	37296000	3729600	372960	37296			372960000	0.986666667	98.67%
35'	36792000	3679200	367920	36792			367920000	0.973333333	97.33%



$I \times T$ (KJ/cm <sup>2</sup> )	Tiempo (min)	N/No
0	0'	1
0.032100	5'	0.986666667
0.128400	20'	0.986666667
0.224700	35'	0.973333333

Promedio Intensidad (W/m<sup>2</sup>)  
**1070**

Condiciones:

Solución Búfer pH = 6.0  
1.0ml Fe 18mM  
0.4ml H<sub>2</sub>O<sub>2</sub> 1000mM  
1.0ml Esporas *B. subtilis*  
Simulador Solar