

(19)
(12)

(KR)
(A)

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(43)

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(30) 19916597.1 1999 04 13 (DE)

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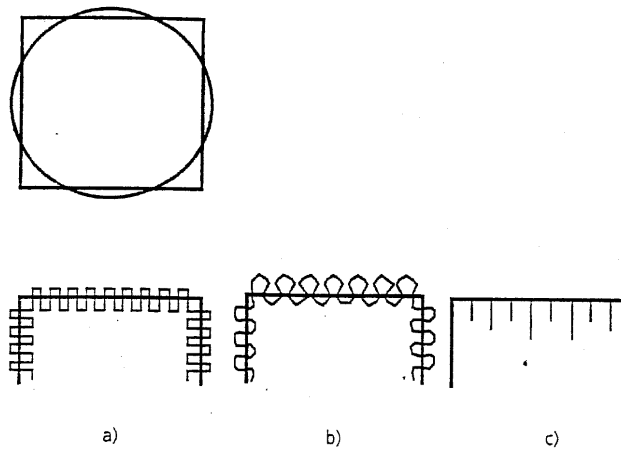
- 80636 54

(72)	,		
	- 70329	가	35
	-	,	
	- 72654		36
	,		
	- 79102		88
	,		
	- 79114		41
	,		
	- 79102		7

(74)

$$\vdots$$

(54) 가 ,



가

() " Biomass and Icosapentaenoic Acid Productivities from an Outdoor Batch Culture of *Phaeodactylum t ricornutum* UTEX 640 in an Airlift Tubular Photobioreactor" , Appl. Microbiol. Biotechnol. (1995), 42, pp. 658 - 663,

() " Autotrophic Growth and Carotenoid Production of *Haematococcus pluvialis* in a 30 Liter Air - Lift Photobioreactor" , Journal of Fermentation and Bioengineering (1996), Vol. 82, No. 2, pp. 113 - 118,

() " Light Energy Supply in Plate - Type and Light Diffusing Optical Fiber Bioreactors" , Journal of Applied Phycology(1995), 7, pp. 145 - 149,

() " A Simplified Monodimensional Approach for Modeling Coupling between Radiant Light Transfer and Growth Kinetics in Photobioreactors" , Chemical Engineering Science (1995), Vol. 50, No. 9, pp. 1489 - 1500.

가

가 CO₂

30%

, CO₂

(,)

()

가 가

(E) β -

가

가

가 -

(self - shadowing)가

(1)

(2)

(3)

가

가

가

" "

가,

1

1

가

, (a)

, (b)

(sin)

. (c)

4

가

가

가

가

(

)

가

가

가

가

가 " (flashing - light effect) . (1Hz)

, ,

, 가 가 가 ,

, 가

(:baffles)

가 , 가

가

가 가 " "

(illumination phase)

가 ,

가 , (holometric) 가

, 가

가 , , 가 ,

E. Locci et al., " Test of a Lead - Plexipop Calorimeter Module Viewed by Wave Length shifter Bars" , Nucl. Instrum. Methods 164, (1979), pp. 97 - 104.

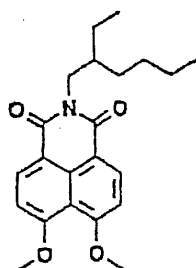
S. W. Han et al., " Radiation Hardness Tests of Scintillating Tile/WLS fiber Calorimeter Modules" , Nucl. Instrum, Methods A365, (1995), pp. 327 - 351.

() , ()

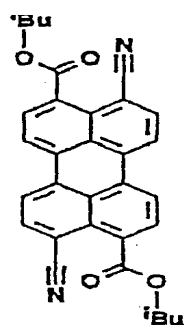
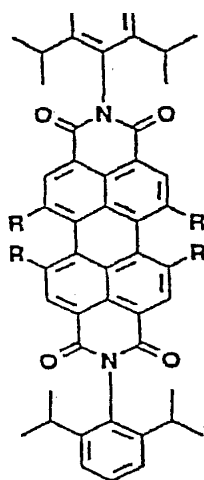
90% , 100%
UV

UV

(Cerenkov)



4,5 - - N - (2,)


$$3,9 - (\quad - \quad) - 4,10 -$$


N,N' - (2,6 -) - 3,4,:9,10 -
) - 1,6,7,12 - - 3,4:9,10 -

N,N' - (2,6 -

10,000l/mol · cm

10^{-7}

10^{-2} mol/l

0.1

10mm

가

2 (air - lift loof reactor)

(1),

(2),

(3)

(4)

가

가

가

가

가

가

가 가

가

가

()

1Hz

.()

가

가,

(Vigreux)

가

가

CO₂

O₂

가 가

가

3

-

(5)

(7),

(5)

(6,7)

(8)

(9)

(10)

(6,7)

가

(7) 가

가

,

가

4

4

가

가

(가)

가)

가

. 520uE/(m²*s)

2

가

10%

: () 가

[1]

	DW (g/l)	u(1/h)	P(mg/l*h)	(%)
	2	0.016	32	
	4	0.0058	23.2	
	5	0.003	15	
1(1)	2	0.01	20	- 38
	4	0.0082	32.8	41
	5	0.006	30	100
2(2)	2	0.013	26	- 19
	4	0.007	28	21
	5	0.004	20	33

가

DW/l 4g

20

40%

, DW/l 5g

30 100%

가

(57)

1.

가

2.

1

3.

1 2 ,

4.

1 3 ,

5.

1 3 , 가

6.

1 3 , 가

7.

1 2 , -

8.

7 , 가 (1),
(2), (3), (4)

9.

7 8 , 가 ,

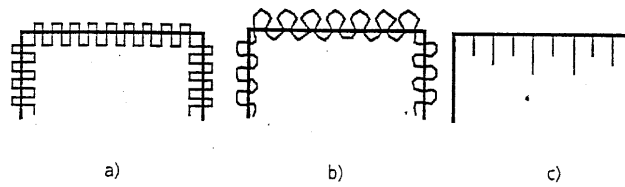
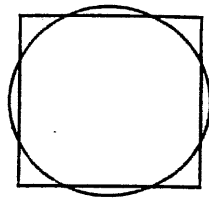
10.

7 8 , -
.

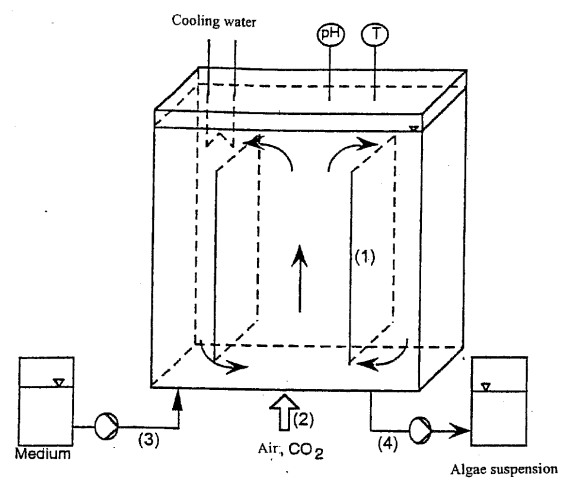
11.

1 10 , .

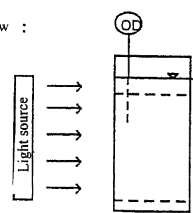
1



2



Side view :



Photobioreactor

Airlift loop reactor - basic type of photobioreactor

3

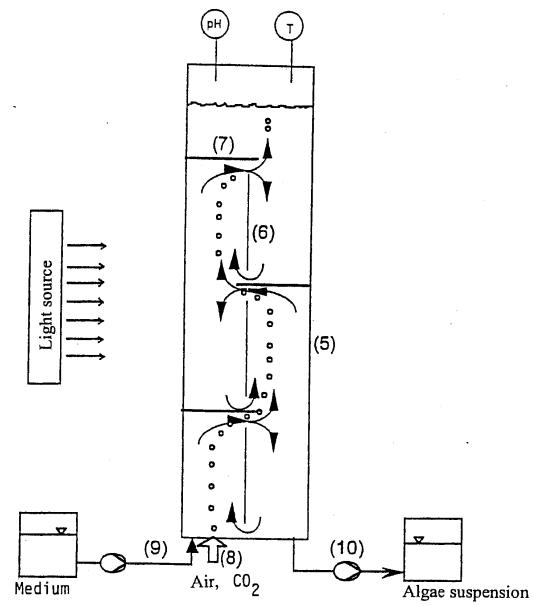
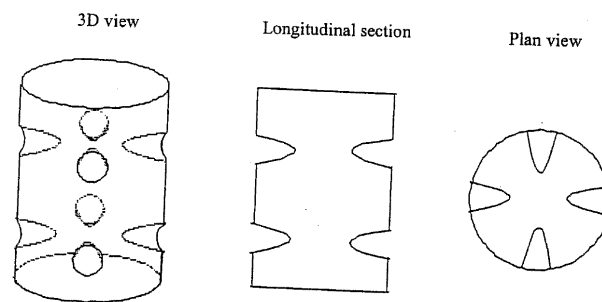
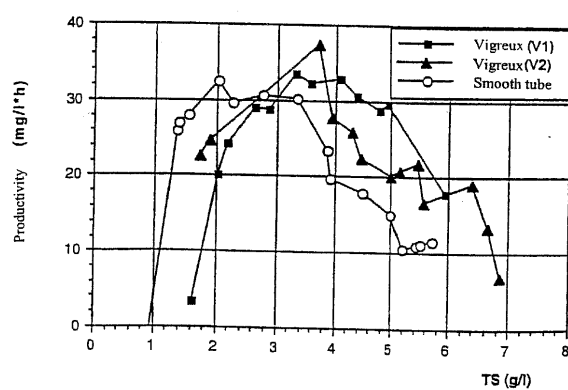
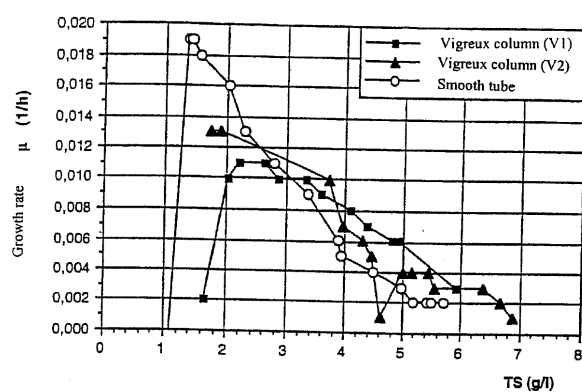


Plate-fin column

4



5



Growth rate and productivity of *Chlorella vulgaris* as a function of cell concentration in reactors with and without lateral recesses (Vigreux column and flat tube)