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东方电气评论



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双 C 谐振单元的动态可重构型均衡技术研究

..... 刘姝仪 王晶 吴文彭等(1)

超纯铈铟镉高压合成过程探究及工艺优

..... 钟连兵 张程 李在为等(1)

的

..... 王煥 李娜 郑 等(15)

研究 张 (18)

研究及

..... 等(25)

压 研究

..... 张 张 二 等(32)

的 (3)

高 构 王 等(41)

的 及

..... 等(45)

的 研究 张 (5)

C 的 构优 李 文 等(54)

1 3 李 等(58)

优 研究 (2)

的研究

..... 王 等(7)

衡的 王 (73)

的 王 张 (7)

的 态

..... 文 王 等(84)

[JCN51-1333/TM*1987*q*A4*88*z ¥8 *75 *17*2 25_ 3

1. DEC Academy of Science and Technology Co. Ltd. 611731 Chengdu China
2. Dongfang Electric Autocontrol Engineering Co. Ltd. 618000 Deyang Sichuan China

(metal-oxide-semiconductor field-effect

transistor, MOSFET) $\propto \sim$,

2(a) π ,

$S_2 S_{03} S_4 S_{21} S_{42} \wedge S_{r3}$, ;

♥ $\pi B_1 \wedge B_3$

LC π ; $\pi B_1 \wedge B_3$

, 5

LC π , , LC π ,

~ $\wedge$, (1-2):

$$C_{\text{equ}} = \frac{C^2}{2C} = \frac{C}{2} \quad (1)$$

$$L_{\text{equ}} = 2L \quad (2)$$

$C_1 \wedge C_2$, ♥

♥ $\mathbb{L}$, ♥

$v_{\text{equ}} ; B_1 B_2 B_3 \wedge B_4$ ♥

: $V_1 V_2 V_3 \wedge V_4 ; B_2 \wedge B_4$

♥ V_{2+4} , ♥

$\wedge$, (3-4):

$$v_{\text{equ}}(t) = V_{2+4} - [V_{2+4} - v_{\text{equ}}(t_0)] e^{\alpha \Delta t_0} (\cos \beta \Delta t_0 - \frac{\alpha}{\beta} \sin \beta \Delta t_0) \quad (3)$$

$$i_{\text{equ}}(t) = [V_{2+4} - v_{\text{equ}}(t_0)] \frac{1}{L\beta} e^{\alpha \Delta t_0} \sin \beta \Delta t_0 = -i_{B2}$$

$$\pi \quad , \quad \pi \quad B_4 \quad ;$$

$$B_1 \quad B_2 \quad \wedge \quad B_3 \quad , \quad \wedge$$

$$C_1 \quad \wedge \quad \wedge \quad ,$$

(32-33) :

$$v_{c_1}(t) = V_4 - [V_4 - v_{c_1}(t_0)] e^{\alpha \Delta t_0} (\cos \beta \Delta t_0 - \frac{\alpha}{\beta} \sin \beta \Delta t_0) \quad (13)$$

$$i_{c_1}(t) = [V_4 - v_{c_1}(t_0)] \frac{1}{L\beta} e^{\alpha \Delta t_0} \sin \beta \Delta t_0 = -\frac{i_{B_4}(t)}{2} \quad (14)$$

3(b) π

$$, \quad S_1 \quad S_{02} \quad S_3 \quad S_{11} \quad S_{32} \quad \wedge \quad S_{r3} \quad ,$$

$$; \quad LC \quad \pi \quad , \quad \wedge \quad \pi$$

$$B_1 \quad \wedge \quad B_3 \quad ; \quad B_2 \quad \wedge$$

$$B_4 \quad , \quad \wedge$$

3(c) π

$$S_{r1} \quad S_{r2} \quad \wedge \quad S_{r3} \quad , \quad ; \quad LC$$

$$\pi \quad , \quad \wedge$$

$$C_1 \quad \wedge \quad \wedge \quad , \quad (15-16) :$$

$$v_{c_1}(t) = v_{c_1}(t_2) e^{\alpha_1 \Delta t_2} (\cos \beta_1 \Delta t_2 - \frac{\alpha_1}{\beta_1} \sin \beta_1 \Delta t_2) \quad (15)$$

$$i_{c_1}(t) = -v_{c_1}(t_2) \frac{1}{L_1 \beta_1} e^{\alpha_1 \Delta t_2} \sin \beta_1 \Delta t_2 \quad (16)$$

$$B_4 \quad ,$$

:

$$P_4 = V_4 \times I_{B_4} = \frac{V_4 C \beta}{\pi} \left[\frac{2(1-\gamma^2)V_4 + \gamma(1+\gamma)V_{1+3}}{1-\gamma+\gamma^2} \right] \quad (17)$$

$$B_1 \quad \wedge \quad B_3$$

$$P_{1+3} = V_{1+3} \times I_{B_{1+3}} = \frac{V_{1+3} C \beta}{\pi} \left[\frac{2(1+\gamma)V_4 - (1-\gamma^2)V_{1+3}}{2(1-\gamma+\gamma^2)} \right] \quad (18)$$

π

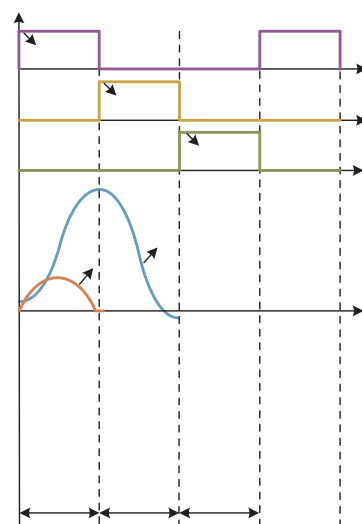
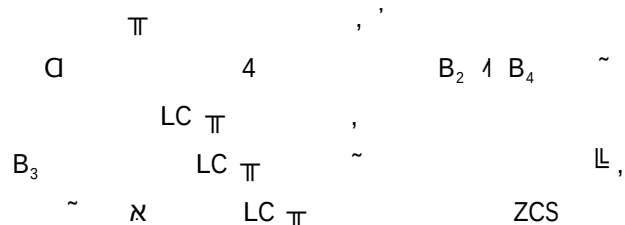
:

$$\eta_{c2p} = \frac{P_{in}}{P_{out}} = \frac{V_{1+3}}{V_4} \times \left[\frac{2V_4 - (1-\gamma)V_{1+3}}{4(1-\gamma)V_4 + 2\gamma V_{1+3}} \right] \quad (19)$$

π

$$P_{c2p} = \frac{C \beta}{\pi} \left[\frac{2(1+\gamma)^2 V_4 V_{1+3} + (1-\gamma^2)(4V_4^2 - V_{1+3}^2)}{2(1-\gamma+\gamma^2)} \right] \quad (20)$$

3.1



4

$$U; \quad \pi \quad U$$

$$(11) \quad , \quad \wedge \quad U$$

(21) :

$$\eta_{p2c} = U \times \frac{-4(1-\gamma)U+2}{2\gamma U+1-\gamma} \quad (21)$$

$$C \quad 4.7 \mu F, \quad L \quad 22 \mu H,$$

$$\pi \quad R \quad 0.1 \Omega, \quad ,$$

$$\gamma \quad , \quad 0.929 \quad 8, \quad (21) \quad ,$$

$$\wedge \quad U \quad :$$

$$\eta_{p2c} = U \times \frac{2-0.280 \quad 8U}{1.859 \quad 6U+0.070 \quad 2} \quad (22)$$

(22)

5

$$5 \quad , \quad \wedge \quad 0.2 \quad ,$$

$$\wedge \quad \wedge \quad , \quad \wedge \quad 0.2$$

$$[0.85, 0.9] \quad \wedge$$

$$\wedge \quad 0.5, \quad (21) \quad ,$$

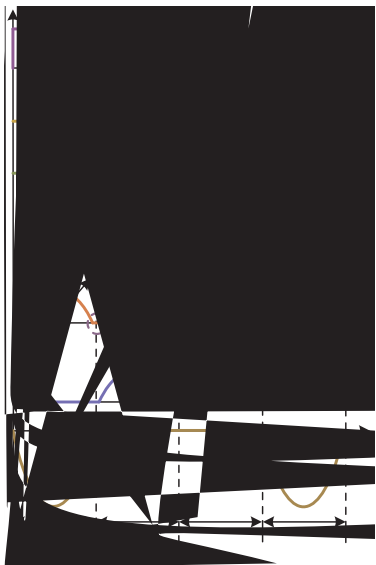
$$\gamma, \quad L \quad \wedge$$

C L/C ψ π R

6



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7

4.7 μF , 22 μH ,
0.1 Ω , γ

π 0.929 8, (23)

♥ U :

$$\eta_{c2p}=U\times\frac{2-0.070\ 2U}{1.859\ 6U+0.280\ 8}\quad(24)$$

(24)

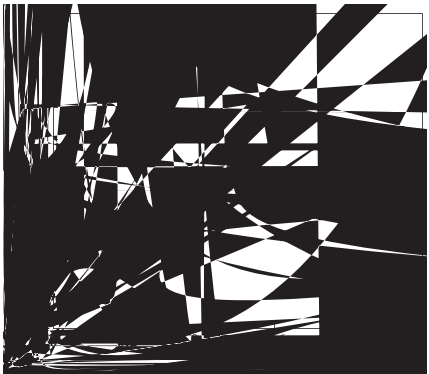
♥ ψ

8 8 , ♥
0.5 ^ , ♥ $\dot{I}$,

♥ 0.5 ,

[0.8,0.9] $\perp$ ♥ 0.8,
(23) , :

$$\eta_{c2p}=\frac{6+4\gamma}{25-15\gamma}\quad(25)$$



8

1 L/C ψ
R 9

6 L/C R
6 ,
R , 1 L/C
 π , π

3.2

π , ♥ B_4 ♥
 π , B_1 1 B_3 ♥ $\square$
♥ , '
7
 B_4 LC π LC
, B_1 1 B_3 ~ π ~ $\propto$ '
 π , LC π , ZCS
♥ 1
♥ U; π ♥
, (19) ,

U :

$$\eta_{c2p}=U\times\frac{2-(1-\gamma)U}{2\gamma U+4(1-\gamma)}\quad(23)$$

4040-4052

[2] , , , . [J] . ,2021,41 (15) :5294-5310

[3] , , ~ , . Ω π

： (Cd_{1-x}Zn_xTe, CZT)

CZT

， ： 1 130 6 h 4.0 MPa, 7N CZT

Te , Fe Ni B 0.5×10⁻⁶% , Zn

： ； ； ； ；

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:1001-9006(2025)03-0010-05

ZHONG Lianbing ZHANG Cheng LI Zaiwei YANG Wuyong

Sichuan Dongshu New Materials Co. Ltd. 61800 De

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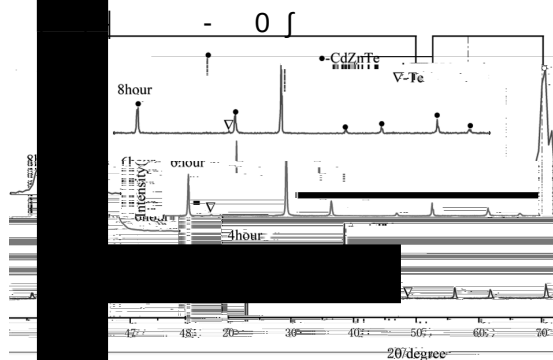
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$\text{Cd}_{0.9}\text{Zn}_{0.1}\text{Te}$

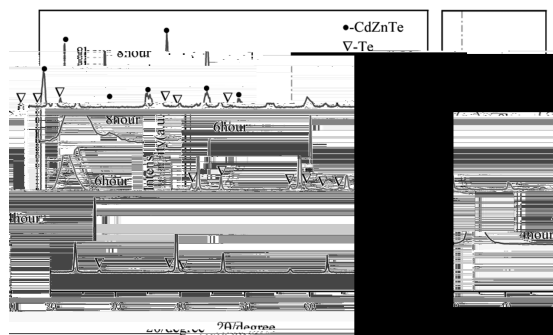
2 XRD 3 (XRD) 1 150 π Te



XRD

XRD

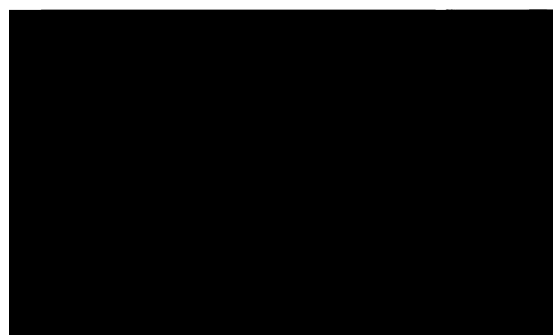
Te



XRD

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Te



XRD

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1 3.5 MPa ,

Te π

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3.0 MPa ~

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Zn π

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XRD

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： 25 60 NaCl-NH₄Cl-
H₂O NH₄Cl，
NH₄Cl 95 %，25
95 %
： ； ；
：O658. 6 :A :1001-9006(2025) 03-0015-03

WANG Huan LI Na ZHENG Mingmei YANG Lu LIANG Quanyun DENG Yi
Dongfang Boiler Co. Ltd. 643001 Zigong Sichuan China

:2024-12-16

:“ ”； ”:2022JDTD0009

: (1986—)，,2012

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H: () () () ()

1.2

(1) 98.050 g 20.250 g 250 mL 500 mL 500 mL 19.61 %, 4.05 % [4] (2)



1 1 200 mL 1 L 60 85 mbar 1

45 25 30 min NaCl—NH₄Cl—H₂O 1.55 g 100 mL 1 L ICP Na⁺ Cl⁻ NH₄⁺ 0.78 g 100 mL 500 mL ICP Na⁺ Cl⁻ NH₄⁺

2.1

25 1

	(mL)	()	(mbar)	(mL)	()	(g)	(g)	(%)	(%)
1	200	60	85	96	20	18.08	5.80	99.59	96.53
2	200	60	85	106	20	22.36	4.85	99.44	96.48
3	200	60	85	112	20	25.98	4.35	94.98	96.83
4	200	60	85	120	20	30.89	3.34	83.52	95.14

2.2

2 60 :19.61 %,4.05 %, A 5

ABD B D B C C

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— — , $\ddot{V}$, $E =$ - e $\ddot{O}$ - — - $\dot{L}$ — — 0 - $\ddot{y}$ α

1 [4-5]

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$\dot{u}$,

[7-14]

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$\dot{P}$ $\dot{M}$,

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$\dot{u}$, $\dot{L}$,

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3 3 12 m 3 MW
(
~) 4 3 MW
;
1.2
Var 27.01 % ,
≥1 300 (1)
1

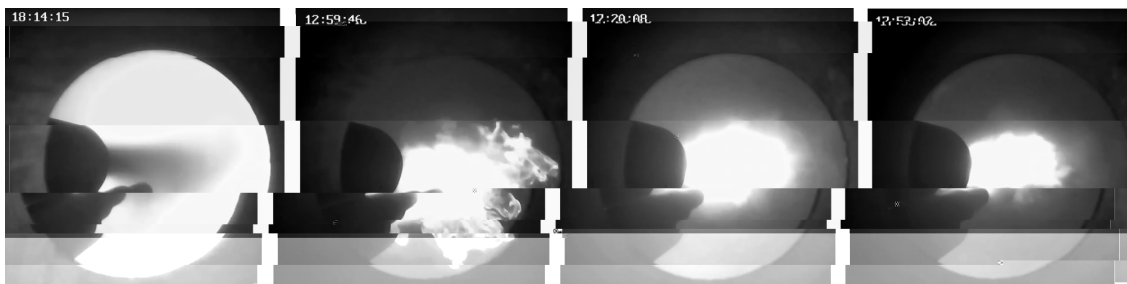
$Q_{ar,net} /$ ($MJ \cdot kg^{-1}$)	$w_{ar} / \%$								$/$		
	M_t	V_{ar}	A_{ar}	C_{ar}	H_{ar}	O_{ar}	N_{ar}	S_{ar}	DT	ST	FT
25.74	7.00	27.01	10.73	68.18	3.90	9.08	0.66	0.43	1 300	1 320	1 360

1.3 4
25 % 30 %
O₂
NOx
NOx
50 L, Ω 20 MPa
2
O₂ 6 % NOx
2

	Nm^3 / h	Nm^3 / h	Nm^3 / h	Nm^3 / h	$/ \%$
1	15	100	135	29.98	12.5
2	15	104	135	29.98	12.5
3 25 %	15	100	135	29.98	13.2
4 30 %	15	100	135	29.98	13.2
5 i	15	100	135	9.50	4.2
6 i	15	100	135	13.80	6.1
7	15	100	135	13.80	6.1
8	15	100	135	19.87	8.8
9	15	100	135	13.	

2.1

25 % 30 %
3(a) ; 3(b) (c) (d)
6
25 %
30 %
29.98 Nm³/h,
99.9 % , 90~100 kg/h,
12.5 %~13.2 %
3
(a) , 3(b)
(,) , 3(c) (d) [18]



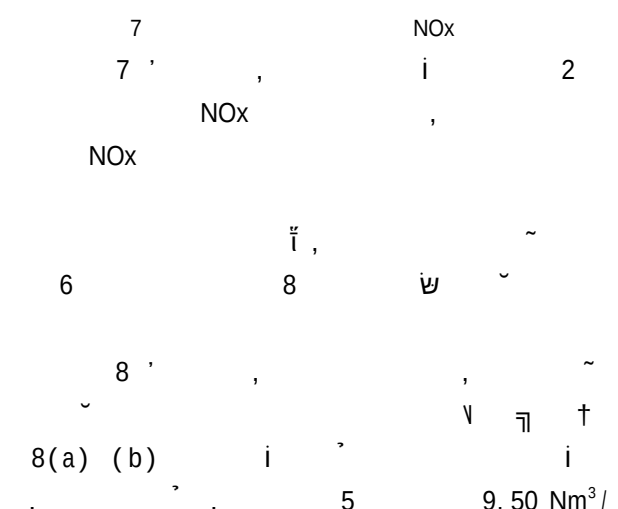
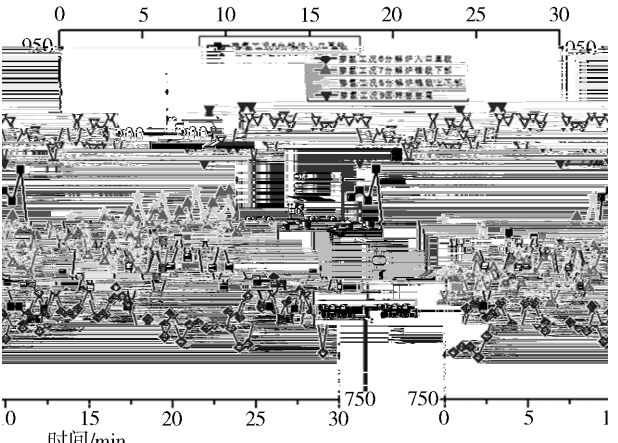
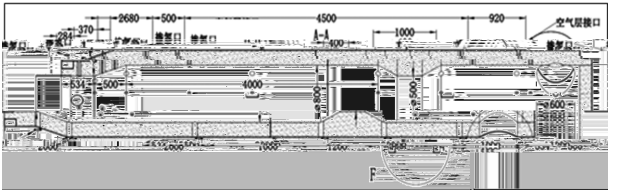
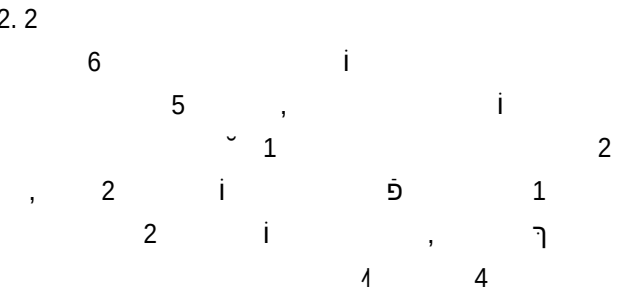
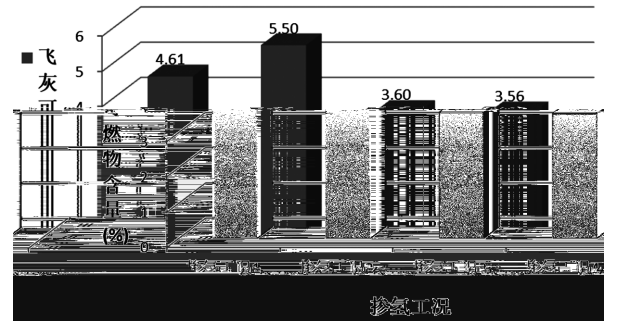
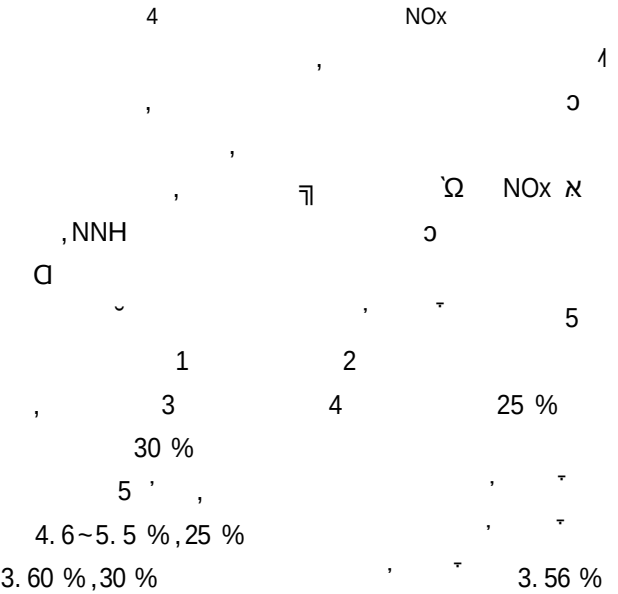
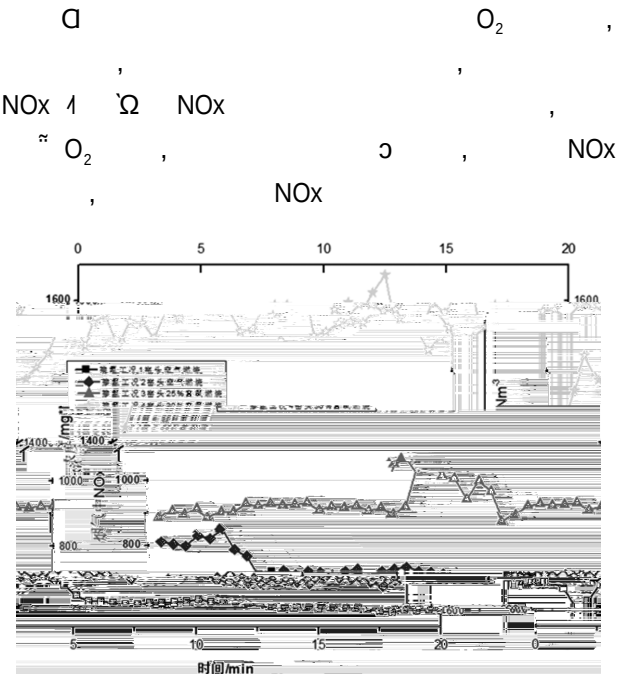
(a)未掺氢空气燃烧

(b)掺氢空气燃烧

(c)25%富氧掺氢燃烧

(d)30%富氧掺氢燃烧

3
NOx NOx CH
CH
NOx
6 %^[20]
NOx
NOx
NOx
NO₂ NO
NO₂ NO₂
25 % 30 %
25 % 30 %
(b) (c) (d)
NOx 600~850 mg/Nm³ ;
25 % NOx
870~1 070 mg/Nm³ ; 30 %
NOx 1 420~1 640 mg/Nm³
NOx NOx NOx



(b) 6(i)



9 5~8 9 1



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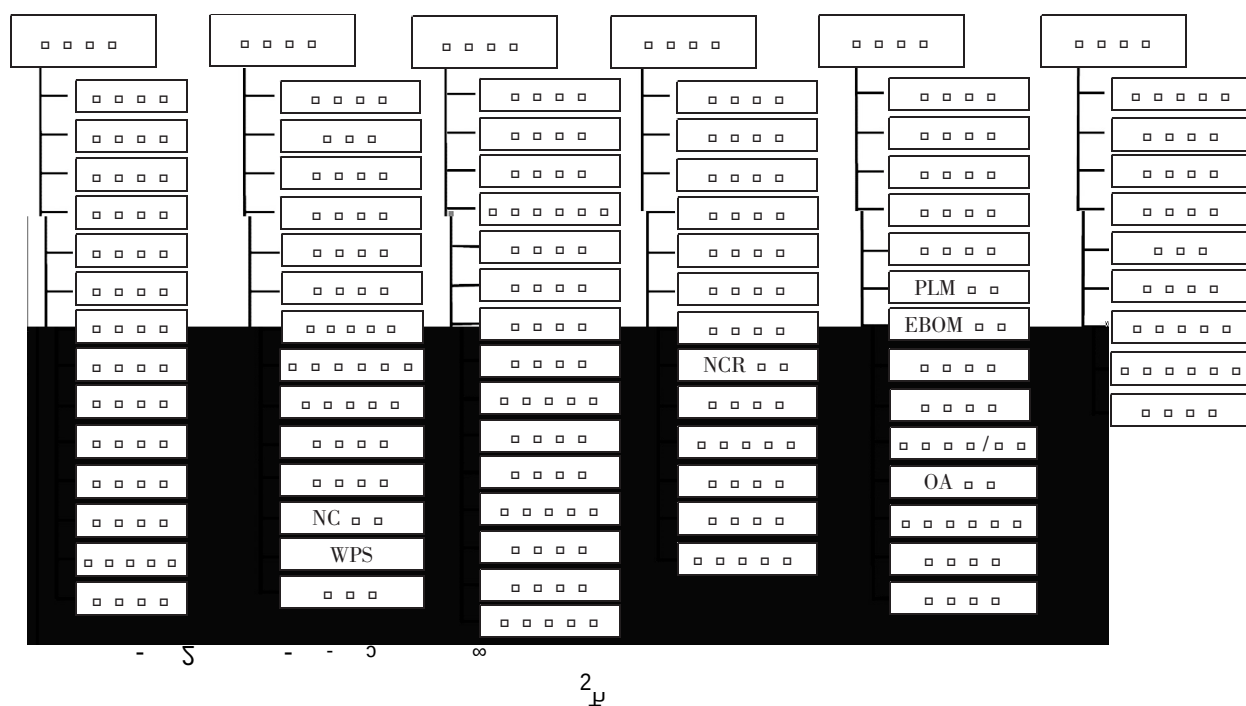
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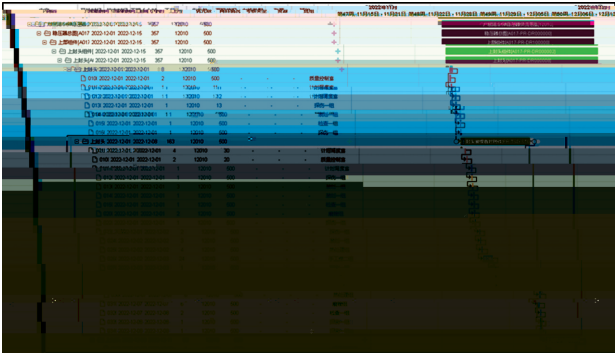
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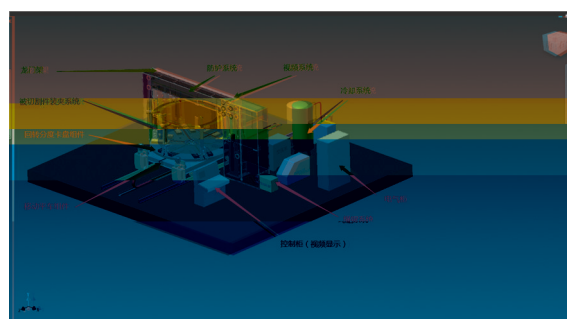
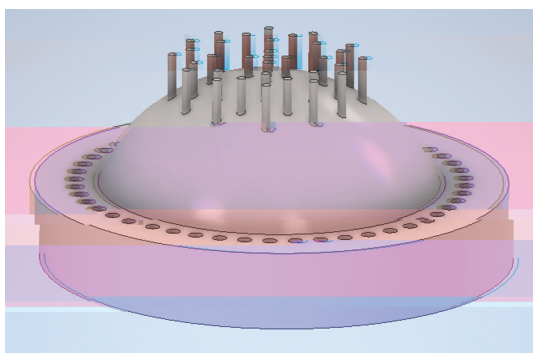
'H

3

'H

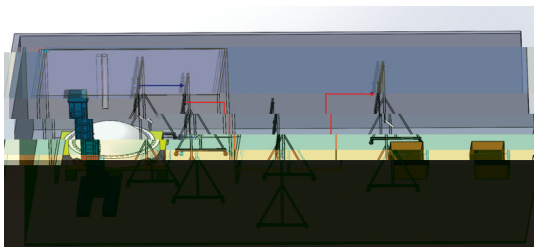
0 mm

'H

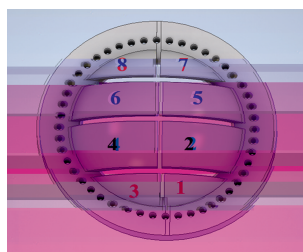
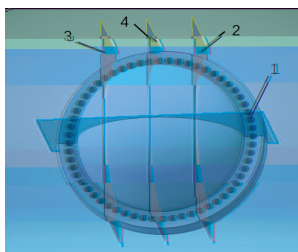


1.3 1# 3
(5 t), 'H
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'H
'H 'H
'H ~ , 'H
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'H,

‘H’，~
‘H’ ‘H’：
(1) ‘H’
1) ‘H’，
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Ω，
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2) π 50 kg，
，，‘H’ ~，
FA-，
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‘H’ ~ 2 t，‘H’
4



4
(2) ‘H’
1) ‘H’ ~
，‘H’ 4 ‘H’，
5 ~ 1 ‘H’，~
‘H’ ‘H’ 90°，‘H’
90°，‘H’
‘H’ ~，
2 3 4 ‘H’，‘H’ ~ 6，
1 3 7 8 ‘H’ 1 t，
3 4 5 6 ‘H’ 2.5 t
2) ‘H’ ~，‘H’
：‘H’
‘H’，
~ Ω
，~ ‘H’
‘H’，‘H’
~ ‘H’
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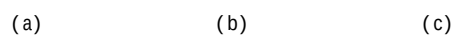


5 6
(3) ‘H’
‘H’ ‘H’
，~ ‘H’ ‘H’
45° 90° 135°，‘H’
8，27 t，‘H’ ~ 3.
4 t ~ ‘H’
、

2.1

Ω π ψ κ
“ ”，β π
，‘H’
ψ ‘ω
♥Ω ‘H’，‘H’
ψ
；□，
ñ，~ ñ ψ
：
(1) ‘H’，β
，β
；
(2) ‘H’ ~，
4 ð
(3) ♥Ω ‘H’
(4)，
ñ，ñ~ ψ

ψ



7

[illegible]

10



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'H , '
, ♂ 1 ~ X
♥ Ω 'H 'H
, ~ 'H ♥

: 2025-01-16

: (1981—), , 2009

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Ω

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ψ

p

2.2

2.2.2

D (Damage) :

$$D=p+E \quad (1)$$

D , , 3

2.2.3

()

() , $d = d_1 \times d_2 \times \dots d_n$ (2)

L (Level) :

$L = P \times D \times d = P \times (p + E) \times (d_1 \times d_2 \times \dots d_n)$ (3)

L 4

d (difficulty) :

	4	(	1	)	
	(5-6)	•	(3-4)	(1-2)	(0)
' (5)	25-30		15-20	5-10	0
' (4)	20-24		12-16	4-8	0
(3)	15-18		9-12	3-6	0
(2)	10-12		6-8	2-4	0
' (1)	5-6		3-4	1-2	0

5
3.2

3.1
6

5								
				,				
				(d1)	(d2)	(d3)	(d4)	(d5)
(d)	1. 0	1. 5	1. 8	1. 5	1. 5	1. 6	1. 4	1. 4

(1) (1) 4
(2) π : E
(3) : 4
(4) : 4
(5) :
(6) :
1.5+1.5+1.6=4.6,
1.8+1.5+1.5+1.6=

6.4
P p E ,
L = P D d = P (p + E) 6.4 (4)
(L),
6
6 , 6 50
6 , 6

		6	5				
				(D)			
		(P)	(p)	(E)	(L)		
γ	—	1	2	2	31. 2		
		1	2-3	3	39~46. 8		
	Ω	1	1-2	1-2	15. 6~31. 2		
		1	1-2	1	15. 6~23. 4		
		1	1-2	1-2	15. 6~31. 2		
		1	1	1	15. 6		
		1	1-2	1-2	15. 6~31. 2		
		1	1-2	1	15. 6~23. 4		
	ψ η	2	1	2	46. 8		
		2	2	2	62. 4		
		2	1	1	31. 2		
		1	1	1	15. 6		
		1	2	1	23. 4		
		2	1	1	31. 2		
	γ	1	1	1	15. 6		
	ψ	1	3	3	46. 8		
		2	1	1	31. 2		
		1	2	2	31. 2		
		1	2-3	2-3	31. 2-46. 8		
		1	2	2	31. 2		
		1	2	2	31. 2		
	π	1	3	3	46. 8		
		1	1	1	15. 6		
		1	1	1	15. 6		
		2	1	2	46. 8		
		2	2	2	62. 4		
		4	1	1	62. 4		
	η	1	2	2	31. 2		
2		2-3	2-3	62. 4-93. 6			
2		2-3	2-3	62. 4-93. 6			
2		2-3	2-3	62. 4-93. 6			

3.3 14 ,

45 % ,

ω 1

(1) ω , 1

(2) ,

γ Ω ,

(3) ,

(61)



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:2025-01-21

：（1983—），，2008

（ ） /

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2022

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12.6 m

[illegible]

i 4
 i , d
 , i 6.662 m C1 ,
 , i ,6.662 m C1
 , i ;
 , d
 4 ,
 , 6.662 m 9.562 m ψ C1
 , 4
 C1 δ ~
 Ω,C1 , δ Ω
 Ω 5 % , Ca
 D () ω~
 b ,
 i ,
 i

 ∞

This architectural section drawing illustrates a multi-story building with a complex, multi-gabled roof structure. The drawing shows various internal spaces, including rooms with different ceiling heights and structural elements like beams and columns. The roof is characterized by multiple peaks and valleys, with some sections labeled with dimensions such as 11000, 11000, and 10000. The drawing is a detailed technical representation of the building's internal structure and spatial organization.

[illegible]

1

		$\bar{\phi}$	$\tilde{\sim}$
		(mm)	(mm)
	1/250		
x	$\tilde{\sim}$	1/856	1/854
y	$\tilde{\sim}$	1/9 999	1/9 999
x	$\tilde{\sim}$	1/1 661	1/1 847
y	$\tilde{\sim}$	1/2 538	1/2 545

9 4 10



[3] , , , . δ
 ψ [J]. $\leftarrow$, 2023, 22
 (4):1-5

()

: TM911.4 :A :1001-9006(2025)03-0045-05

1. Dongfang Electric	Chengdu	Hydrogen Technology Company Ltd.	611731	Chengdu	China
2. Hydrogen Electricity Interconversion Key Laboratory of Sichuan Province			611731	Chengdu	China

： (1982—)， ，2008 ， ()
 函 : caol@ dongfang. com

1. 1 000~5 000 m, 1 000 m,
 7.7~10.5 kPa, 5~6,
 60 W/m²

1

1.2.1

2

1

[8]

5	π	ρ				
		3Kp1,4Kp1	3Kp2,4Kp2	3Kp3,4Kp3	3Kp4,4Kp4	3Kp5,4Kp5
γ	g/m ³ (0)	265. 5	234. 8	209. 6	182. 0	159. 7



2.1

1
[9]

2.1.1

(1) : (DCDC) (PTC)

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1

(2) :
Ω,

(3) :
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(4) :
Ω,

(5) :
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Ω,
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2.1.2

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(3) :
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(1) :
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(2) :
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(3) :
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(4) :
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(1) :
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(3) 4 ,
ĩ , ,

(4) 4 ,
J , ,

2. 1. 4

7l , 1 000 m
J , 1 000 m, 6 %
,

Q

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,

State Grid Jiangsu Electric Power Co. Ltd. Suzhou Power Supply Branch 215000 Suzhou Jiangsu China

： (1991—)， ， ~ ： Ω ， Ω

$\frac{1}{2}$ $\frac{1}{2}$

88

2

2

(3) $\vdots$ $\vdots$ $\vdots$

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[13] :

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$\psi \bullet \psi$

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[10]

(4) :

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$$1 \quad , \quad [11]$$

1.3

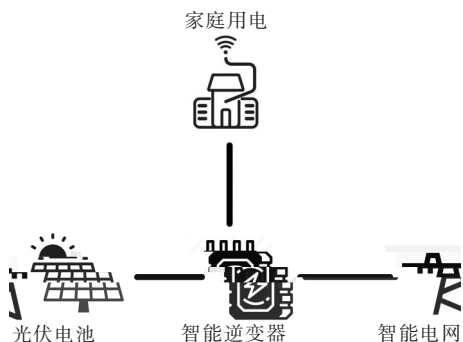
7

3

1 Ω η

ל , ה

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$$(1) \quad \vdash \quad \vdash,$$

[12]

IP

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(2) :

5. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

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2.3

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CPFD

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2	κ	i	()	Nm ³ /h820 000
3	κ	i	()	m ³ /h1 274 208
4	κ	i ♥ Ω(♥)		kPa-0.1
5		♥		kPa96.34
6				12.6
7				%58

2

D50/μm	6.46
/μm	8.65
	2.96
/%	28.13
D3/μm	0.59
D6/μm	0.79
D16/μm	2.10
D25/μm	3.24
D75/μm	11.20
D84/μm	14.80
D97/μm	29.84
D98/μm	32.74



3.1

CFB-FGD

‘H

2

0.02 15 s ~ ,

i

0.2 J



2

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20 s 40 s

28° 32° 35°

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’ ~ ~ η ’

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η

3.3

κ α , α

κ κ κ 4

κ 3

κ , 15 500 mm

28 000 mm

5

SO₂ 4 i η ,

SO₂ 4

18 000 mm ,

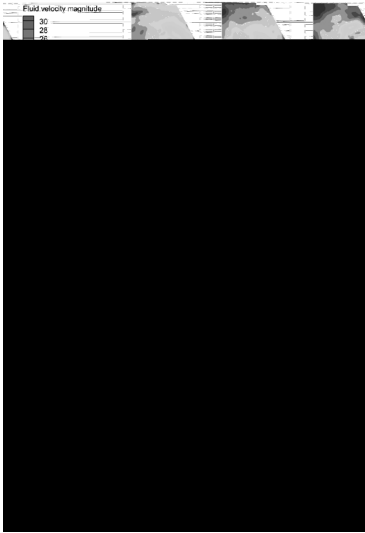
i SO₂ 99.56 % ,

η 5.63 kg/h, η 94 %

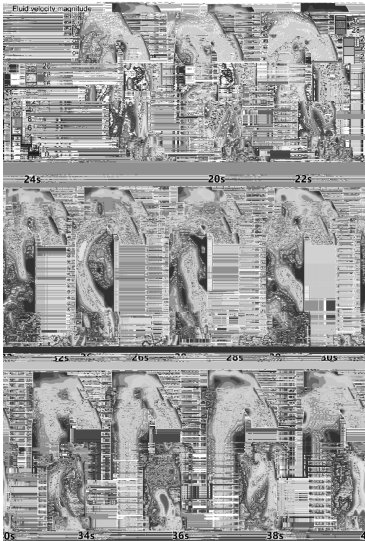
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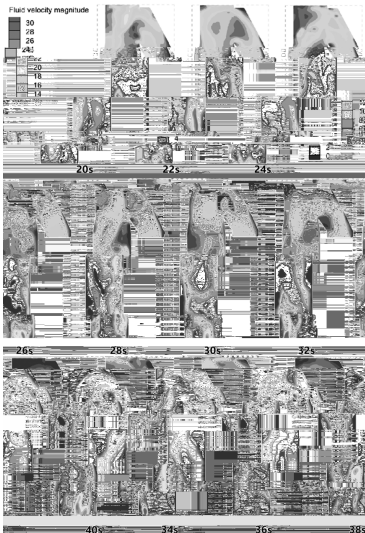
’ η



(a) 28°



(b) 32°



(c) 35°

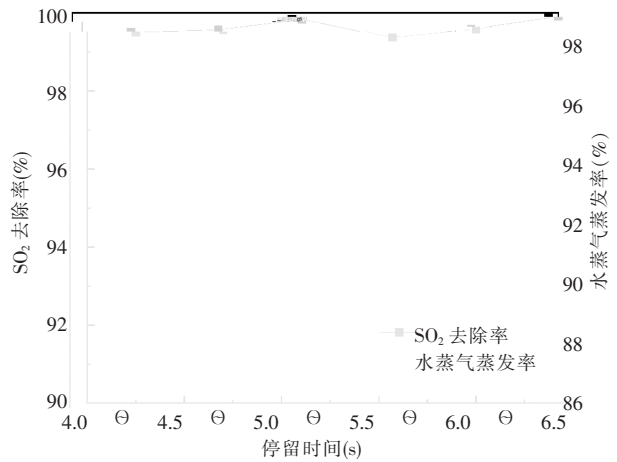
3



4

3

(h)		
	s	mm
1	4.25	15 500
2	4.7	18 000
3	5.13	20 500
4	5.57	23 000
5	6	25 500
6	6.45	28 000



5 SO₂



CFB-FGD Ⅱ , ,

(1) i 28° 35° ,
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(83)



： 660 MW ， 1 030 mm ,1 030 mm
： ； ；
：TK262 ：A ：1001-9006(2025)03-0058-04
1 030

LI Yin CHEN Tao ZHOU Xiending YANG Changzhu
Dongfang Turbine Co. Ltd 618000 Devang Shouan China

：2024-06-17

： (1984—) , ,2007

1 ~

α α , ' ,
o 5

, 1 030 mm ~
~
,
6 1 030 mm ~

!

:1001-9006(2025)03-0062-05

1. North China Power Engineering Co. Ltd. of China Power Engineering Consulting Group 100120 Beijing China
2. Xi'an Thermal Power Research Institute Co. Ltd. 710043 Xi'an China

[illegible]

: xuwh@ncpe.

1.3

’

$$B_1 \otimes B_2 \rightarrow B_1 \otimes B_2 \otimes N_0 \rightarrow B_1 \otimes B_2 \otimes N_0 \otimes N_0 \rightarrow \dots$$

♥ Ω

$\Delta N_T = f_1(N, P_k)$ (8)

$$\frac{\partial f_1(N, Pk)}{\partial Pk} \times \frac{\partial Pk}{\partial W} = \frac{\partial \Delta N_p}{\partial W} \quad (9)$$

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[5] γ , , $\blacktriangleright$, .1 000 M

- [1] , , .
[J]. ,2016,58(1):55-57+60
- [2] . א ב ש [J].
,2017,4(5):82-85
- [3] , , , . י ל
[J]. ן ,2013,33(8):619-624+625
- [4] ה , , , . ש
ן ה ,2018,47(3):12-17
- [5] ם , , ► . 1 000 M

() , ;

:TM614 :A :1001-9006(2025) 03-0067-06

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1. Dongfang Electric New Energy Technology Chengdu Co. Ltd. 610036 Chengdu China

2. Dongfang Electric Wind Power Co. Ltd. 618000 Deyang Sichuan China

:2024-06-25

: (1988—), ,

wangy8013@ dongfang. com



$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, $\frac{1}{128}$, $\frac{1}{256}$, $\frac{1}{512}$, $\frac{1}{1024}$, $\frac{1}{2048}$, $\frac{1}{4096}$, $\frac{1}{8192}$, $\frac{1}{16384}$, $\frac{1}{32768}$, $\frac{1}{65536}$, $\frac{1}{131072}$, $\frac{1}{262144}$, $\frac{1}{524288}$, $\frac{1}{1048576}$, $\frac{1}{2097152}$, $\frac{1}{4194304}$, $\frac{1}{8388608}$, $\frac{1}{16777216}$, $\frac{1}{33554432}$, $\frac{1}{67108864}$, $\frac{1}{134217728}$, $\frac{1}{268435456}$, $\frac{1}{536870912}$, $\frac{1}{1073741824}$, $\frac{1}{2147483648}$, $\frac{1}{4294967296}$, $\frac{1}{8589934592}$, $\frac{1}{17179869184}$, $\frac{1}{34359738368}$, $\frac{1}{68719476736}$, $\frac{1}{137438953472}$, $\frac{1}{274877906944}$, $\frac{1}{549755813888}$, $\frac{1}{1099511627776}$, $\frac{1}{2199023255552}$, $\frac{1}{4398046511104}$, $\frac{1}{8796093022208}$, $\frac{1}{17592186044416}$, $\frac{1}{35184372088832}$, $\frac{1}{70368744177664}$, $\frac{1}{140737488355328}$, $\frac{1}{281474976710656}$, $\frac{1}{562949953421312}$, $\frac{1}{1125899906842624}$, $\frac{1}{2251799813685248}$, $\frac{1}{4503599627370496}$, $\frac{1}{9007199254740992}$, $\frac{1}{18014398509481984}$, $\frac{1}{36028797018963968}$, $\frac{1}{72057594037927936}$, $\frac{1}{144115188075855872}$, $\frac{1}{288230376151711744}$, $\frac{1}{576460752303423488}$, $\frac{1}{1152921504606846976}$, $\frac{1}{2305843009213693952}$, $\frac{1}{4611686018427387904}$, $\frac{1}{9223372036854775808}$, $\frac{1}{18446744073709551616}$, $\frac{1}{36893488147419103232}$, $\frac{1}{73786976294838206464}$, $\frac{1}{147573952589676412928}$, $\frac{1}{295147905179352825856}$, $\frac{1}{590295810358705651712}$, $\frac{1}{1180591620717411303424}$, $\frac{1}{2361183241434822606848}$, $\frac{1}{4722366482869645213696}$, $\frac{1}{9444732965739290427392}$, $\frac{1}{18889465931478580854784}$, $\frac{1}{37778931862957161709568}$, $\frac{1}{75557863725914323419136}$, $\frac{1}{151115727451828646838272}$, $\frac{1}{302231454903657293676544}$, $\frac{1}{604462909807314587353088}$, $\frac{1}{1208925819614629174706176}$, $\frac{1}{2417851639229258349412352}$, $\frac{1}{4835703278458516698824704}$, $\frac{1}{9671406556917033397649408}$, $\frac{1}{19342813113834066795298816}$, $\frac{1}{38685626227668133590597632}$, $\frac{1}{77371252455336267181195264}$, $\frac{1}{154742504910672534362390528}$, $\frac{1}{309485009821345068724781056}$, $\frac{1}{618970019642690137449562112}$, $\frac{1}{1237940039285380274899124224}$, $\frac{1}{2475880078570760549798248448}$, $\frac{1}{4951760157141521099596496896}$, $\frac{1}{9903520314283042199192993792}$, $\frac{1}{19807040628566084398385987584}$, $\frac{1}{39614081257132168796771975168}$, $\frac{1}{79228162514264337593543950336}$, $\frac{1}{158456325028528675187087900672}$, $\frac{1}{316912650057057350374175801344}$, $\frac{1}{633825300114114700748351602688}$, $\frac{1}{1267650600228229401496703205376}$, $\frac{1}{2535301200456458802993406410752}$, $\frac{1}{5070602400912917605986812821504}$, $\frac{1}{10141204801825835211973625643008}$, $\frac{1}{20282409603651670423947251286016}$, $\frac{1}{40564819207303340847894502572032}$, $\frac{1}{81129638414606681695789005144064}$, $\frac{1}{162259276829213363391578010288128}$, $\frac{1}{324518553658426726783156020576256}$, $\frac{1}{649037107316853453566312041152512}$, $\frac{1}{1298074214633706907132624082305024}$, $\frac{1}{2596148429267413814265248164610048}$, $\frac{1}{5192296858534827628530496329220096}$, $\frac{1}{10384593717069655257060992658440192}$, $\frac{1}{20769187434139310514121985316880384}$, $\frac{1}{41538374868278621028243970633760768}$, $\frac{1}{83076749736557242056487941267521536}$, $\frac{1}{166153499473114484112975882535043072}$, $\frac{1}{332306998946228968225951765070086144}$, $\frac{1}{664613997892457936451903530140172288}$, $\frac{1}{1329227995784915872903807060280344576}$, $\frac{1}{2658455991569831745807614120560689152}$, $\frac{1}{5316911983139663491615228241121378304}$, $\frac{1}{10633823966279326983230456482242756608}$, $\frac{1}{21267647932558653966460912964485513216}$, $\frac{1}{42535295865117307932921825928971026432}$, $\frac{1}{85070591730234615865843651857942052864}$, $\frac{1}{170141183460469231731687303715884105728}$, $\frac{1}{340282366920938463463374607431768211456}$, $\frac{1}{680564733841876926926749214863536422912}$, $\frac{1}{1361129467683753853853498429727072845824}$, $\frac{1}{272225893536750770770699685$

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 : ISO12944 CX

(3)



2.1

החומר המבודד, בעל מוליכות תרמית λ , מונח בין שתי קירות המורכבים מלוחות בעובי δ וקוּדְמָה α .
 הנתונים הם: $\lambda = 0.035 \text{ W/m}^\circ\text{C}$; $\delta = 0.1 \text{ m}$; $\alpha = 0.01 \text{ m}$.
 חשבו את:
 א. המוליכות התרמית של הקירות, k .
 ב. המוליכות התרמית של החומר המבודד, k_{ins} .
 ג. ההפסד התרמי, Q , דרך הקירות והחומר המבודד, עבור שטח $A = 10 \text{ m}^2$ ופרשי טמפרטורה $\Delta T = 100^\circ\text{C}$.
 ד. המוליכות התרמית של הקירות, k , עבור $\lambda = 0.035 \text{ W/m}^\circ\text{C}$ ו- $\delta = 0.1 \text{ m}$.

3.3.3

	8	11
	†	,
C1	†	C5
	8	
(μm/a)		
	0.26	C1
	112.29	C5

11
GB/T 33630—2017 Ω n
J
≤ C3^[2] C1 ,
J

Ω n
~

(24)
[6] . [J]. , 2011(24):300+307
[7] , , V . [J]. , 2023(S1):174-177
[8] , , . φ [J]. , 2023,15(4):91-98
[9] , ☆ . [J]. , 2013,42(4):7-10
[10] † . [J]. , 2013(1):112-115
[11] , . ψ [J]. , 2014,28(S1):336-338
[12] , , . [J]. , 2014(4):17-20
[13] , , . ψ

H2,
C1 , GB/T 33630—2017 Ω n
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S2 , 4
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Ω n
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Ω n

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[1] . NB/T 10927—2022 † 4
- Ω n [S]
[2] † 4 ,
ο † . GB/T 33630—2017 Ω n
[S]
[3] , ο † . GB/T
19292.4—2018 4
[S]
[4] † 4 ,
ο † . GB/T 30790.2—2014 4
2 : [S]

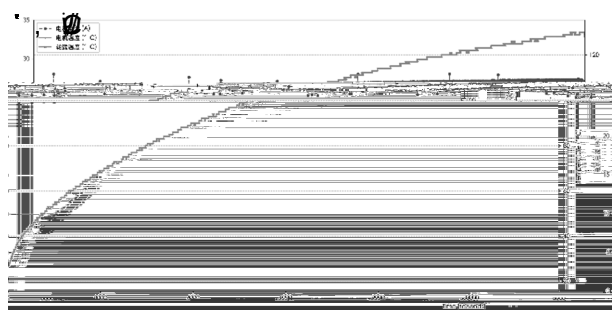
[J]. , 2015(1):46-48
[14] † , † , . [J]. , 2021(7):179-181
[15] , , V 4 . Ω ψ
ο [J]. , 2019(1):42-48
+6
[16] , , . ψ
[J]. , 2024(10):1-4
[17] , , .
[J]. , 2024(6):7-14
[18] † , , , . Ω
[J]. , 2023,48(6):197-202
[19] . / ψ
[D]. ← , 2018
[20] , , .
[J]. , 2024,44(7):1-24



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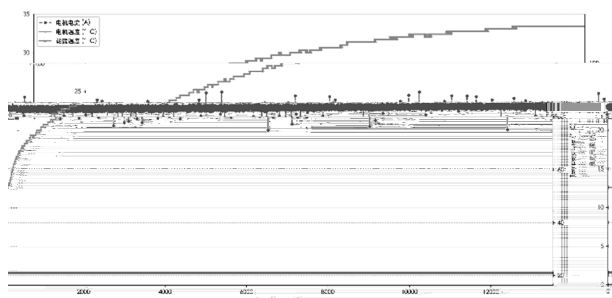
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2 65 N m 1 000 r/min

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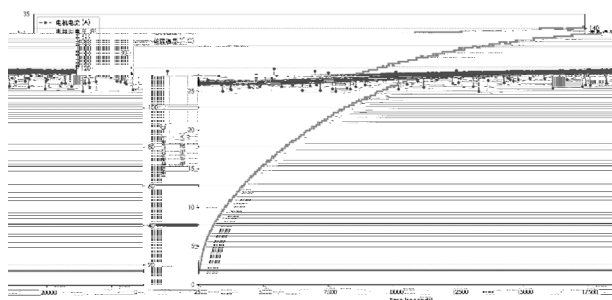


3 60 N m 1 000 r/min

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4 65 N m 873 r/min

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; SCADA;

WANG Qingzhao YANG Heli ZHANG Hui

Dongfang Electric Wind Power Co. Ltd. 618000 Deyang Sichuan China

: 2024-06-04

: (1986—), 2023

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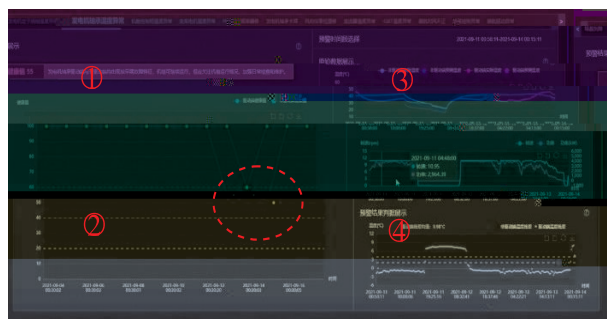
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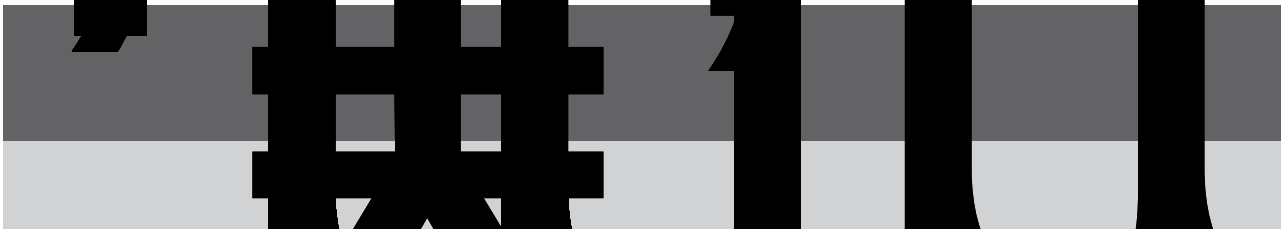
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XIAO Wenjing LIU Zhengyu WANG Duoping HONG Chengqi WANG Zhengjie

DEC 19th of



:2025-03-20

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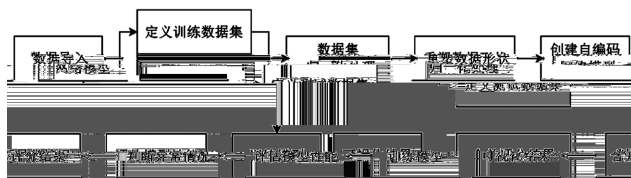
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2 560 Hz, 128 kB

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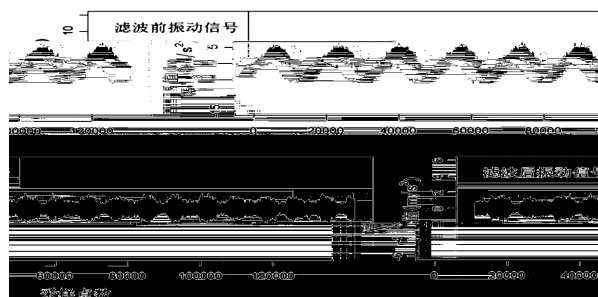
$$X_1 \sim Z$$

2 "

$$\frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{-x^2} dx = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{-x^2} dx$$

Butterworth

0.1 Hz, 10 3 #5

$$1 \quad \sim \quad \omega \sim$$


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$$1/\pi \sim \chi^2 \sim 1/Z$$

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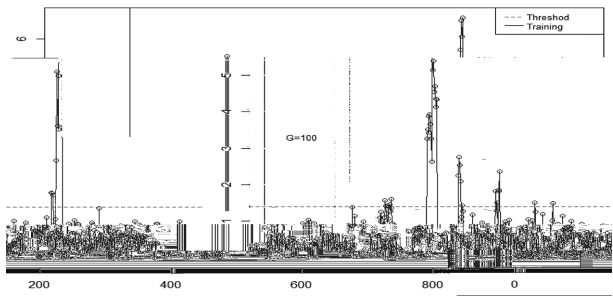
4 #4 ~ 3 π X/Z

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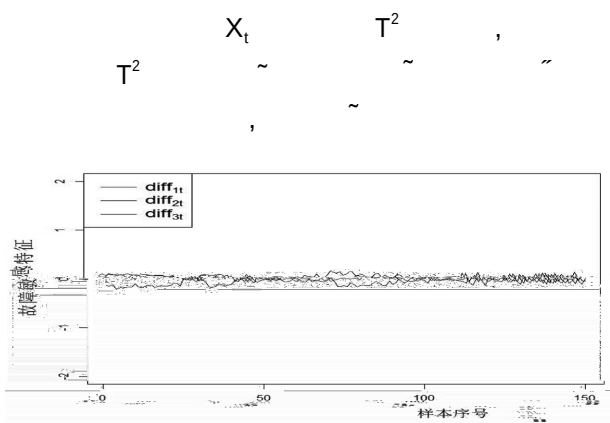
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#5	~ 1	2023-11-02
#8	~ 3	2023-09-28, 2023-09-29
#14	~ 1	2023-12-23
#14	~ 3	2023-12-25



4 #4 3 X/Z



~



5 #5 FSF

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