

—

2003/11/06

2005/01/17

()

DPCA

pH

(DPCA)

 $[\text{Fe}(\text{OH})(\text{O-phen})_3]^{2+}$ $[\text{Fe}(\text{OH})_2(\text{O-phen})_3]^+$

.(DPCA)

. DPCA

:

The catalytic activity of ferric ions with o – phenathroline in chemi-luminescence reaction of luminol

Mowaffak Mahrouka

Department of Chemistry-Faculty of Sciences-Damascus University

Received 06/11/2003

Accepted 17/01/2005

ABSTRACT

It is found that the ferric ions, as a catalyst, have a weak effect on the oxidation of luminol "triaminoptal hydrazid" by (DPCA) and through chemi-luminescence reaction. For increasing the catalytic activity of ferric ions we used organic and nonorganic compounds. The best compound was o – phenathroline. It forms two different complexes with ferric (A) and ferrous (B) ions (A, B). The formation of hydrolyzed mixture of the complexes (Ph-Fe³⁺) depends on the pH. We found that (Ph-Fe³⁺) complex was very effective in chime-luminescence process above mentioned.

Key word: Chemi-luminescence, Catalyst, Luminol, Ferric ions.

[2 1]
[4 3]
[O₂⁻]

H₂O₂

[5] (H₂O₂)

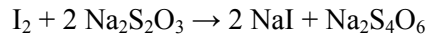
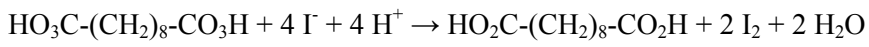
[6]

∞,∞

[8 7 6]

: - 1

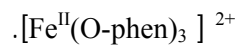
:



:

25

DPCA



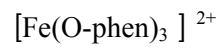
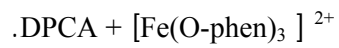
SP-4A

nm 350

1

(2cm) ФЭК-56M

()



(320 -240) nm

(4)

(590 - 320) nm

:

2

:

1

pH

7

1

()

1

()

:

3

		(DPCA)	-
94%			
10^{-2} M	(-3)
			(0.1 M)
			α, α
pH = 9.2			
			4
25 mL		0.05g	
2 mL		10 mL	3 ml
0,01 M		2 mL $5 \cdot 10^{-2}$ M	
0,5 mL			
	8,5 ml	10^{-3} M	
	0,5 mL	pH = 9,2	
		$\cdot 10^{-3}$ M	
		0,5 mL	
		30	
		(1)	

AAS

CL

(1)

0.1 µ g/ml

(5)

(µ g/ml)		%R.S.D	
CL	AAS	AAS	CL
0.095	0.098	2.155	3.158
0.090	0.096	4.381	4.555
0.102	0.098	3.251	3.559
2.732	3.918	0.099	0.097
2.964	2.108	0.100	0.105

:AAS

:CL

:(Fe^{2+,3+} + DPCA + O-phen)

1

()

(2)

DPCA

Fe^{2+,3+} + DPCA :

(2)

PH = 5,0		PH = 4,0		(min.)
Fe ²⁺ + DPCA	Fe ³⁺ + DPCA	Fe ²⁺ + DPCA	Fe ³⁺ + DPCA	
λ = 250 nm				
0.118	0.112	0.051	0.033	1
0.120	0.115	0.052	0.028	2
0.123	0.108	0.048	0.030	5
0.107	0.094	0.047	0.032	10
0.093	0.072	0.052	0.039	15
0.078	0.070	0.055	0.040	30

[DPCA] = 2x10⁻⁴ M [Fe] = 2x10⁻⁵ M :

(3)

(Fe^{2+,3+} + DPCA)

DPCA

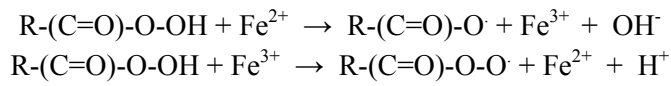
DPCA

(3)

4 .10 ⁻⁵ M	3 .10 ⁻⁵ M	2 .10 ⁻⁵ M	1 .10 ⁻⁵ M	DPCA
$\lambda = 250 \text{ nm}$				(min.)
0.111	0.106	0.096	0.071	5
0.112	0.108	0.091	0.080	10
0.118	0.100	0.082	0.067	20
0.155	0.105	0.105	0.135	30

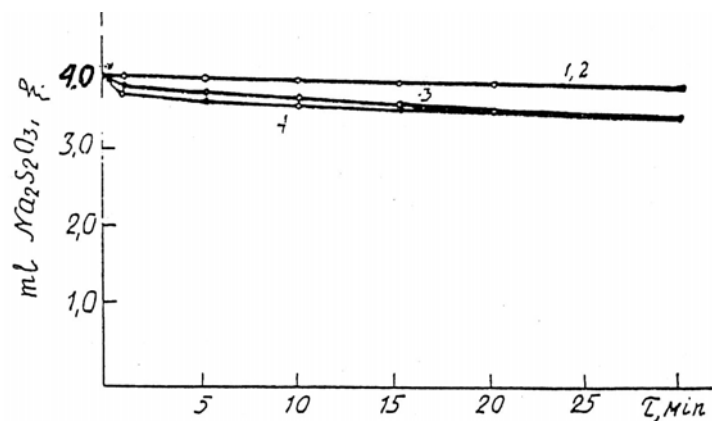
pH = 6 [Fe]³⁺ = 2x10⁻⁵ M :

pH = 5 -
 pH = (2 - 3) 20%
 ()
 DPCA
 (30) pH .
 DPCA
 DPCA (II , III) -
 () (-)



DPCA 2

DPCA : DPCA -
 (1) .[9]
 DPCA (III, II) pH
 pH = 2
 DPCA



2.3 1.4 : DPCA (1)

[Fe^{2+,3+}] = 10⁻⁴M [DPCA] = 2x10⁻³ M :

.pH=9, 2 3.4 pH=2 1.2 [Na₂S₂O₃] = 0.01M

:

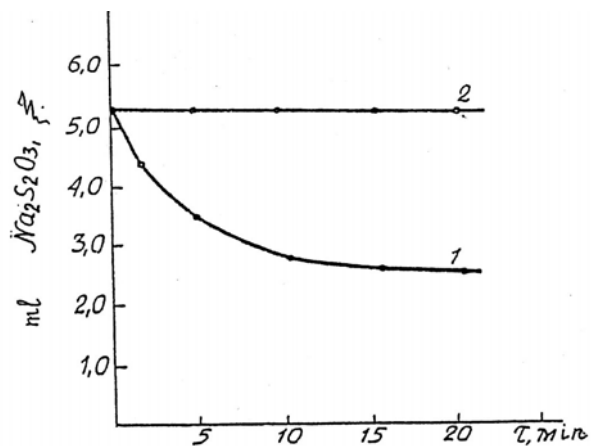
:

(2)

(

DPCA

+ Fe²⁺ + DPCA)



: DPCA (2)

[Fe²⁺] = 5 x 10⁻⁵M [DPCA] = 1.1x10⁻³M [o-phen] = 10⁻³M :

.pH=2 (2) pH=9, 2 (1) [Na₂S₂O₃] = 0.01M

DPCA
DPCA [Fe (O-phen)₃]²⁺

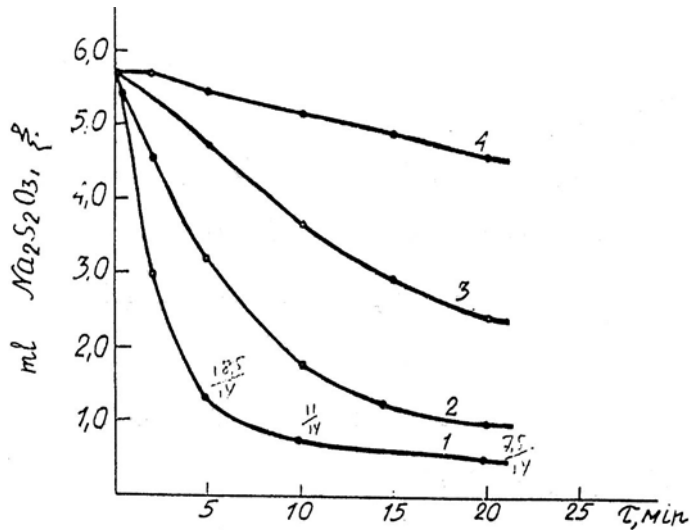
(4) DPCA

(4)

$5 \cdot 10^{-5}$	$4 \cdot 10^{-5}$	$3 \cdot 10^{-5}$	$2 \cdot 10^{-5}$	$1 \cdot 10^{-5}$	[Fe(O - Ph) ²⁺ M
6.6	8.5	9.5	12.0	20.0	t (min)

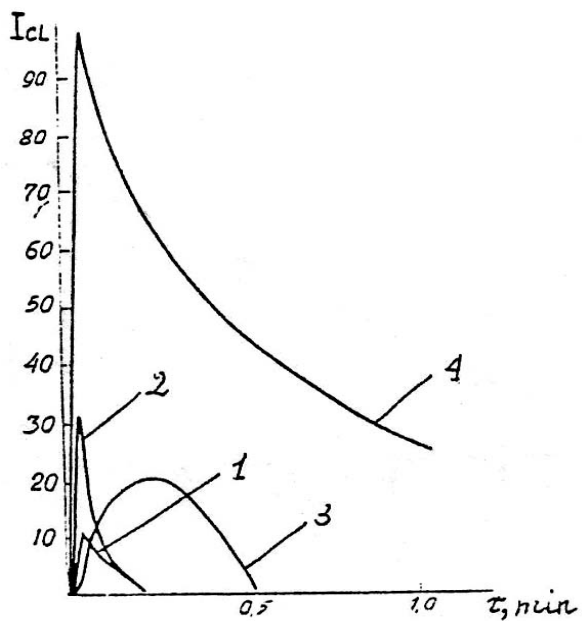
: DPCA - DPCA
(3) 4 3.5

(4)



PH DPCA (3)

PH = 4 (1) [DPCA] = 2×10^{-3} M 2.5×10^{-5} M :
.PH = 9.2 (4) PH = 8 (3) PH = 2 (2)



: $[H_2L] = 10^{-4} M$ (5)

DPCA + Fe (II) + O-phen - 3 DPCA + Fe (II) - 2 DPCA + Fe (III) - 1
 $[DPCA] = 2 \times 10^{-3} M$ $[Fe] = 5 \times 10^{-5} M$ $pH = 9.2$.DPCA + O-phen + Fe (III) - 4

:

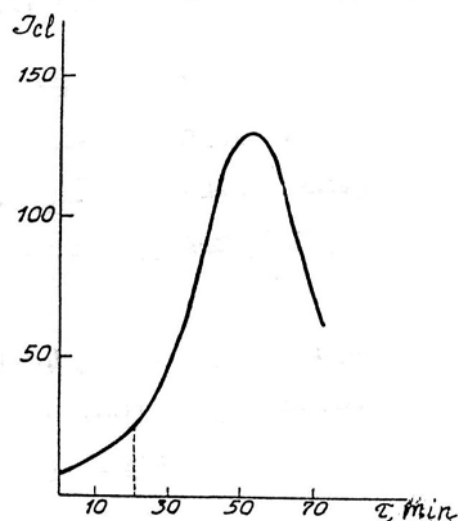
DPCA

(6)

DPCA

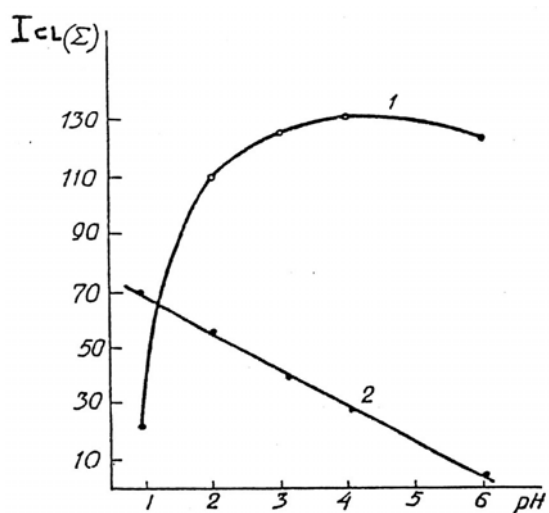
(7)

$pH = 4$



(6)

$[H_2L]=10^{-4} M$ $[DPCA]=3 \times 10^{-3} M$ $[Fe(II)(O-phen)_3]^{2+}=5 \times 10^{-5} M$ $PH=9.2$:



(7)

30
 $DPCA+H_2L +$:
 .pH (2) . pH (1)

$[H_2L] = 10^{-4} M$ $[DPCA] = 3 \times 10^{-3} M$ $[Fe(II)(O-phen)_3]^{2+} = 1 \times 10^{-5} M$:

