! " # # $ **Wuli Huaxue Xuebao**
Acta Phys. -Chim. Sin %

诱导环糊精形成纳米管的研究

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摘要　6 8 9 : ; < = >? @ A < >A < B C D E F G @ < H I J K L M N O !"**p**"P Q R "S "Q R 嘂 T ( ) 1 U V W X Y Z [6 \ ] ^ _ ( ) ` a b c d e 1 $\beta$" f g # X h i ` a b c j e k l m n o p q β" f g r s t \ u v e w x ( ) y k l p q γ" f g r s t \ u z { | β" ( ) ` $\gamma$" } ~ • X A < w I ! " # $ _ % X & ' ( ) y * + O W , \ u - x c . X 0 h ! / 0 1 | ( ) g z m 2 $\gamma$" 3 4 f g O 5 R 6 i X 7 8 F 9 b : 5 - . m n o ^ _ p q $\beta$" f g X r s t ` 0 | F 9 b j | X U ; < " = ? > ? `

关键词：　r s t　U V W　A < B C D E　G @ < H I
中图分类号：

" " " "
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!"**p**" "
" "
β"
γ" γ"
β"
γ"

:

@ A B C D $ E O F G H "I Q R J K L ( ) = 1 β" F γ" ` } ~ • M N ( ) O [ 6 P @ D Q f g r s R b X t S T U V l W M N X z / n @ D Q x Y Z [ O a \ X ] ^ J 6 ? @ A < _ A < B C D E K L z ( ) 1 U V W ` O X Y Z [6 m a O b 2 X M N M N \ ] ^ _ ` } c i ~

d ( ) y k l p q β" F γ" f g r s t ` M N ( ) X e [f " F " 1 U V W [6 e g w x " = f g r s t hv i j γ" X k R l 6 m n R o p q r s t y " = f g J r M N O ( ) X s t v 7 "F G H I Q R u I L F "F G H I Q R v w L 1 U V W X Y Z

" % h "
+ , @ x * # R y z { | }

[6 \ ] ^ _ r s t X f g 1 ( ) X R $ c R X ( ) = 1 U V W f g h i (c R X ( ) g p q U V W f g r s t J X M N ^ _ w t 嘫T ( ) X e [f "I Q R" "I 嘫T > "I Q R 嘫T >"Q R"" "I Q R" "I 嘫T F " !"I Q R" "I 嘫T y k l p q γ" f g X r s t \ u h ` / r s t X f g N 3 嘫T ( ) l 0 g z m 2 γ" 3 4 X A < < = l $ 5 R 6 i ! x /

A < ( ) X n H = ( ) q ( ) } X < $ w g ( ) 9 y $ M N ^ _ n ( ) y k l p q U V W f g r s t X \ u

A W B C D y ` P | / = p q U V W f g r s t X $ ( ) ` 0 - . X R w x O t / i X ( ) / \ ] ^ _ ( ) ? ` < U V W r s t X f g k = 0 n t c X x Y

!"p"P Q R"S "Q R 嘫T ( ) \ u H [n X A < V F 6 | ( ) > >• Y 9 b >, A < J M N 6 8 9 : ; < = > ? @ A < < = F G @ < H I J - . M N w x ( ) y = p q β" F γ" f g r s t

实验部分

试 剂

α" ≥ γ" F 6 β" & ' S U " # d (6 K } \ s q 6 - . 6 X d (_ - . ` / 9 < m a

仪 器

G @ < H I < = 6 " <) Y (< 5 < X

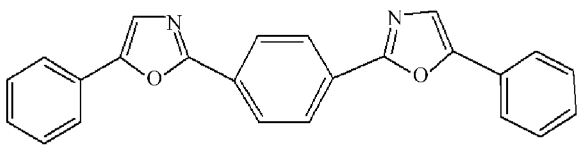

图　　的分子结构式

% !"p" "

H I $ 9 b % ` H I k X < 2 I < X b 5 k = X 0 & ' 8 9 : ; < = 6 " 8 9 "k (< < b < ? @ A < w I _ A < B C D E X 6 " A < (< < b 5 w F w I X l $ 9 b : 5 - . 6 U } 9 6 n t H 9 b W b & % 2 i i X 9 b

实验方法

~ | ~ • a b (X • 6 m i o X • • V n " N i ~ • X ' F n > V X U V W ~ • | 2 K } > $: 5 X - . ~ • X 6 X F n " ~ • G @ < H I X i ` 6 μ X N l ~ • X 0 ) _ 3 X k = W X ` X `

结果和讨论

分子在不同溶剂中的紫外吸收光谱

( ) ` } > > F $\alpha$" $\beta$" $\gamma$" } ~ • X 8 9 : ; < = 1 k Y z | } ~ • 0 : ; ! X ! ( ) ` m F $ & ' ` $\alpha$" } ~ • $ ' ( ` β" F γ" } ~ • $ _ %

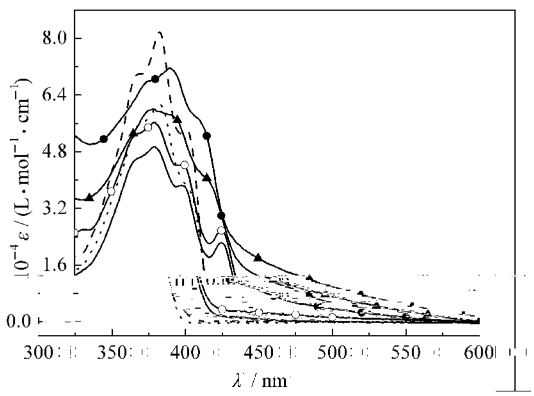

图　　分子的紫外吸收光谱

c (c
""" n"
○ α"　▲ γ"　● β"

X & ' ` q s ~ • r `

$ _ % X H I x Y -

α" } ~ • ~ • ("β"

F "γ" } ~ • x n > 3 b X

q X X ! ? ` n >

-β- 溶液中 ： 包合物的形成

( ) ` " v a b β" } ~ • X A

< w I < = k l ( ) `

d a b **(** e X A < b β"

a b ! (! 0 e V 7 - " F S @ v e

( ) ` $\beta$" } ~ • X A < ( ) 1 ` }

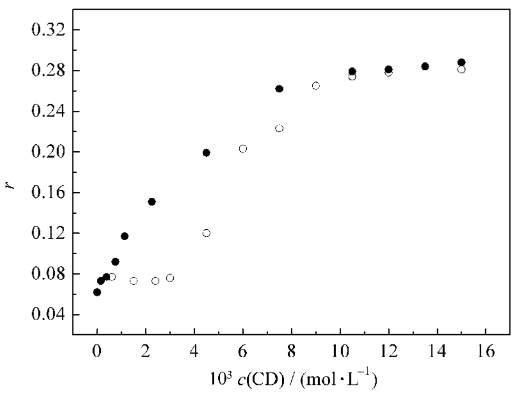

图　　分子的稳态荧光各向异性值 *r*
-　*r*
)○) β　)●) γ　c　(　·

F γ" X 0 a b e X r (j : F (z | ( ) ` } X r # ( ) ` β" F γ" } ~ • A < B C D E X ! 0 ^ _ e ( ) X ; G < O 0 X = / n x Y k 6 r s t X f g W > ` r s t h i | U V W 3 4 X ( ) X ? ; < O 0 X = @ ( ^ x c j X r ` γ" } ~ • X A < w I ! Y z | β" } ~ • " # $ _ % X & ' ( ) ^ A ( ) W , \ u X ! y B + O - x n . ! / 0 1 | γ" 3 4 c 0 ( ) g z m 2 γ" 3 4 f g 5 R 6 i X 7 8 C x ( ) = p q β" F γ" l f g r s t \ u D ( ) ` / s r s t X $ " v ` X ( ) R 0 1 t X E h(` q X 0 g z X E ` 8 9 : ; F A < w I < = X ! f F ! l 0 " n i X

E F . N G H X H I < z A < B C D E X I n t J K H f r′-r r! T T H r! - L X A < B C D E r 0 X A < B C D E T 0 M I < X b 1 2 I < X b ` {

q J N O + J K H ` X O P V 7 X Q 6 E I O n t R E X J K H %

r! r r! K×A
H K { S A : < b

1 | c 0 R U V W r s t X f g ("β" F ("γ" X c i ~ • - x X ` 6 ( ) X A < B C D E ( F . T C ` $ U V z + V 7 X A < B C D E m a J W l X J K H F O n 7 " v a b β" } ~ • (( ) X : < b l : < b X Y Z 1 : < b [K H J H \ ] X T T I l ^ Y Z + y _ 0 r! r r! X 0 ! 3 ` 1 G H X a - A < B C D E b X c ( f 1 G H X a - 1 ` O X d [X) i \ ] ^ _ s X - (e X E 7 E Y b X / n \ ] R f i M N D X ! . ' ` ~ • 1 H I < G H X B C D E X a - 1 ` O X d 1 : < b - { S 7 1 J K H k l [r! r r! (r k l 1 - . 1 k l [a - X A < B C D E r! j β" a b c e r! 1 r d hj β" a b c 0 e r! 1 r d 0 " N ' k ' z | ("β" X c i ~ • j r s t f g q G H X z ( ) A < B C D E X k l g (z | (

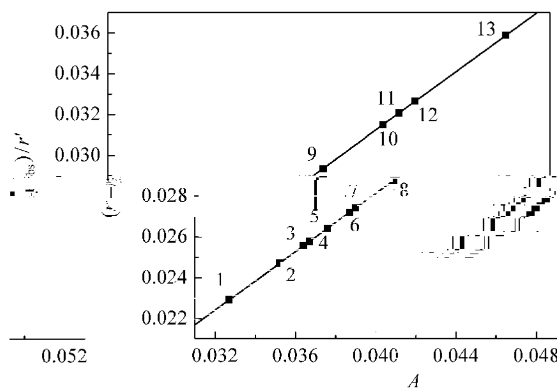

图　不同浓度的β-　水溶液中　　分子荧光各向异性真实值与测量值之间的偏差　*r′ r　r′* 与吸光度 *A* 的关系
r′ r　r′　*vs*
β-
c β"

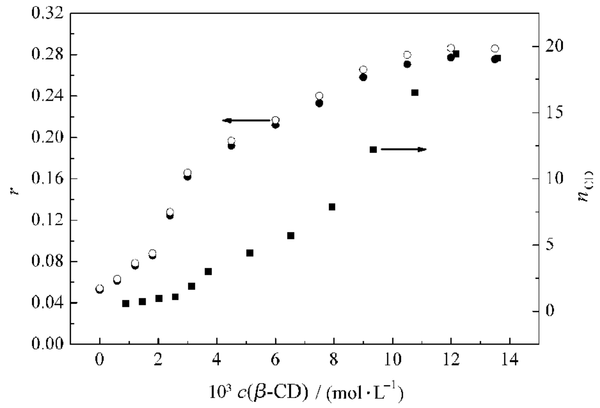

图 不同浓度β- 水溶液中 分子 × · 校 的 -○- 和实 测量的 -●- 荧光各向异性值以及单根 β- 纳米管中所含环糊精单元数目的估算 -■-

-○- -●- -

× ·

β- -

-β- -■-

"β" X c i ~ • 1 | V 7 $ U V W r s t I T U V X f g ~ • (_ % J A < B C D E e w x d 0 ' / h i < X z A < B C D E X 0 " = g X

? @ A < B C D E X > j O n k [r s t U V W 1 l } X K L W " K H

r r τRT ηV

r ^ ( ) X 0 A < B C D E M | e ` m n > z | ( ) (o

r τ ^ A < p q η ^ r s X t b τ F η k u > " % v w A < B C D E r X % " _ 1 r s t X R Y W H k l k ["β" r s t X R

r r r r r r V V

r F r 0 s V 7 ( ) X A < B C D E **V** F **V** / s V 7 ( ) X $: V

k ["β" r s t U V W 1 l } **n** e x (" v a b β" ~ • ( ) X A < B C D E r G 2 # #β" X A < B C D E **c** **(** **c** β" r v w **(V V** X _

Y j | r s t U V W 1 l X } | 0 W J q X r! k [1 W r s t β" 1 l X } \ ] ` "β" r s t β" 1 l X } 0

动态光散射的测量

" M N D E 6 G @ < H I y z M N O α" β" F γ" ` } ~ • B D ( X { ( | \ ] ^ _ U V W ` } ~ • } 0 (l 1 V X f H ? ` v e y $ X T U V I ? B C D y ` / K ~ • O n 2 [X \ . 1 献 $ E \ ] R n f / K U V W ` } ~ • l ? ` s S @ n 流 V P # 半 { ` 左 \ X 1 V I 流 V P # 半 { ` 左 \ X 团簇 T U V

0 Y v a b X K U V W } ~ • 2 n > X ( ) **(** q X G @ < H I = Y 5 X | ^ @ F ^ w x z | α" } ~ • 2 " ( ) z B D (X R 0 _ (| $ 换 o ` ( ) 1 α" ` O k = f g n 0 1 X h i (/ h i X { 0 跟 α" 1 V X " 0 s X X G @ < H I = x (z | $ ( ) X β" F γ" } ~ • O U V W X 1 V F T U V X ! l 9 r n t 流 V P # 半 { 左 \ X ! / 1 W 6 G @ < H I y z M N **N, N**!" " ( ) 1 [6 e

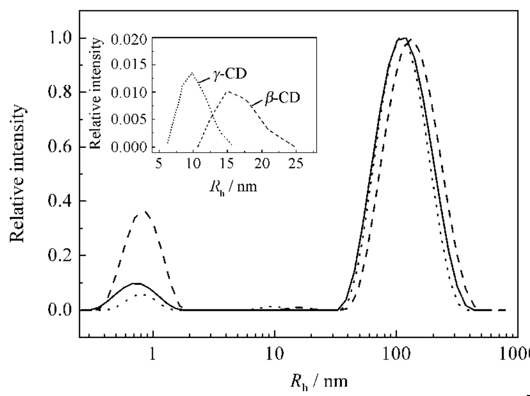

图 加入 分子的水溶液经 -μ 滤膜过滤后的动态光散射图谱

-μ

R

c **(** **c**

α" β" γ"

表　动态光散射测量中 环糊精及环糊精中加入　分子的溶液中各组分的
平均流体力学半径 R 、相对散射光强 I 和质量分数 w 的数据

R　**I**　*w*
"

	R	I	w	R	I	w	R	I	w
α"	&						&		
"α"	&						&		
β"	&						&		
"β"	&			&			&		
γ"	&						&		
"γ"	&			&			&		

"　"μ　c　(　c
c

XxY　注3X0 `MNX/tV7 $ 2　()Xβ" Fγ" }~• 才$新X! x　' 0V7 $ |UV W1VFTUVXn 新\uXfg GHX / 新X\u0　()pqβ" Fγ" fg Xrst\u /n\.1　189<=>A<< =l_A<BCDE(　X\."Fn W 献 X [KL 知 • BD(XHIYz b_ 占(kk[　" V7 Y5D(占Xs (　^　1W UVWrstXs ((　" β" l_　"γ"

值和温度对 -β- 纳米管的影响

键n　' 0rstfgX主V驱G P`n'　N O　()XA<BCDE r　"β" X}~•　%"Xhi ()Xr `　> E_ 碱

XU;<　持"%　~•碱EX! j N XeX候r 骤xb 至 dX /n xY^_　()pqfgXβ" rst =`　| X}~• ?>?` - j~•X　0|β" X **K** f e 1|β" ()X s)" s端XkRl%g On负离) eβ" ()`O Lfg 键 r st * 键[6X驱G("=fg -.\ ]1 献$E\]Yf '　0　"β" }~•　() XA<BCDE 9b%"X 7 kl ()Xr `~•9bcde "%(j9b N e迅速b /n\]^_+ "β" rst`~•9bd|　l<X U; =?>?` j9bj|　erst 始瓦　' rstX/nEs `9 X ()q ()　里R$潜`X56价

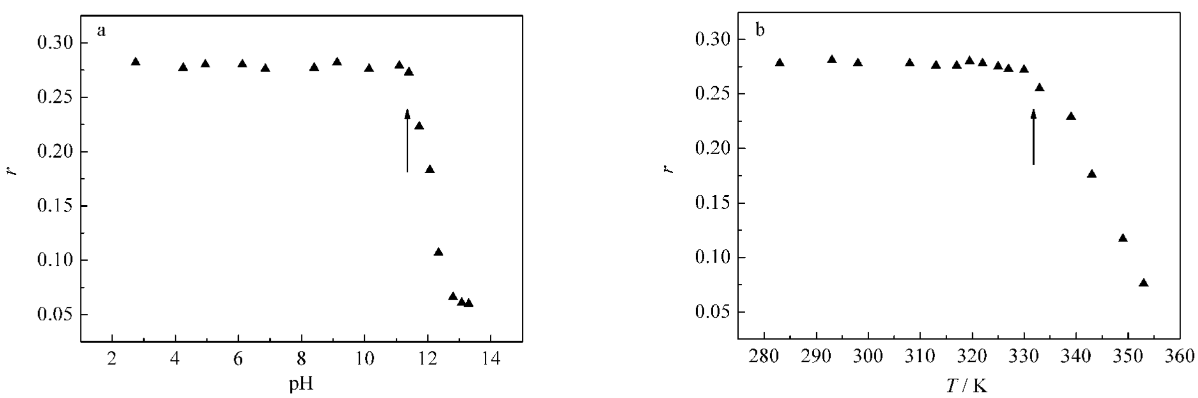

图　分子 × · 在β- · 水溶液中的荧光各向异性值 r
随溶液 值 及温度 变化的关系

- r
β- ·

结 论

8 9 : ; < = F G @ < H I X - . \ ] ^ _
( ) k l p q β" F γ" ` } ~ • f
g r s t \ u ? @ A < X - . \ ] ^ _
( ) ` d a b e 1 β" f g # X h i ` j
a b e k l m n o p q β" F γ" f g r s t
\ u z | ( ) ` γ" } ~ • X A < .
! 0 1 | ( ) g z m 2 γ" c 0 X 3
4 @ (` γ" r s t f g O 5 R 6 i G
H X F 9 b : 5 X - . \ ] ^ _ ( )
p q β" f g X r s t ` ~ • X 0 |
F 9 b j | e " = ? > ? `

Science,
J. Phys. Chem.,
Chem. Phys.,
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Chem. Lett.,
Chem. Phys. Lett.,
Spectrosc. Spectr. Anal.,
张春芬 ~] • j 宏 g < = # 1 < = (
Guangpuxue yu Guangpu Fenxi),

张春芬 博士 # . & ' & ' 0 #

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J. Colloid Interface Sci.,
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Radiat. Phys. Chem.,
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Luminesence,
* **Chem. Phys. Lett.**,
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