

# 中国科学报

CHINA SCIENCE DAILY

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V' WX YZ[ \ ] ^

12! 25" #\$%&' ( ) \* +, - . \$/ O- 123456789: ; < ) = >? ( @ ABCDEF GII JK L @DFG MNOPQ " RSTU

VW @DFGN 2002 XOPSTI YZO 78U6789 @DFG[ \ ] 8^60\_# a @Dbc; 9defg#hi j X9! k' (@D! #6Im@Dno@D) qpr^#st t u' v- 9@Dwx U

myz{ | } ~ @BN! Ns9" # \$%#@D&' (y) \* +@D, - . / 9O 1U2345J #78 @DFG61 y789 (@D: ; <=bc>?#E" @A9{ B CDEFKFGhi #K@D&' HI J { 9 FGKLUM" #6789 @DFGNou@D 26" #9i P#61 Qo@DR@BS6T UVMWYZ[ #\b] @D2^\_Q` a b@B) c: ; bc; 9' dUp (@Def gghi j keu

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; (@AI l mn o? pqOrsz: @ DFG T78Utuk#vwx yz{ >78# Z| W( ) HI u^~ ! 9" #W%#& u@D&' ( ) 9\*+u, ) - . Wt9<O W1h253#45F G45# 672v- E 89^~\*+@Dw+@D) c9: ; U 6789 @DFGNOHi # X9! k' (@D! UW^<=Z02@D>?FG; NOu^ 1" @AB; WBCDcyEOF 9@DnoU 2003 X 6! #2 @DFGGHI P{ S^n nXQJ #: (@VbR' ( KLM@Dn o INNin' (@D) pJ2005X R#OPQ\* R F WASTUCVRno# (@D) WXkj X9! 9. / 1OY" #Z[ ^nU i j uk# @D" ] @D! 9^O#、 uz@D&' abc; ?d#9T} \$%#)

e7fc @D9d#?Q#U3<@g@D& ' . hij 7^KWn9B; I m#NW45 ^1! 9" @DcTopWT d qWT' y 9 @Dno# AS\ 9! 96AXDsMt u v@AW@AW@A9wx#Tq) yz# ^t H)' =@A{ \* # u@A) ~U 6789 @DFG ! ? 4" v- # \$% q@D: ; # ! v- &+! ! @D( ) U m @DFGHe \* +, - W- W / OVM Q' 9@Dbc1i U2: ; - 2@D&' ; b ] 34" d#562#781 { ' 9/@D& ' g) : %9f gU@DW' v- 9>Mwx# ! v- &+VR#: 6l <, - #79. /W@D: ; 9q>tbc#( 6l ? bv -@A?1) VR@D&' 9 ! K?4oK# Qo@D, - ?BH9S6Upj keU

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CDEF #G] 2023 X#9(>HI @D& ' J) 196.8K) ULz @D) cMN+' Oz P09| R#30 @DFG61 um@D) qp ^#z@D) cSuWTUVWMN+' W@ D) q? ! XYO` TuZ[ hi U m^ \ Y@e) q] ^\_9` W@D& ' 9u6#f gU5a#e) q] bcd]ef @ DW. WG; ghi Upm o?2F#61 9n@ D) qp^r: @D&' 9) T) jku ; (@AI \* k1 me fgefqn@ @e& Qo9\* Z\} &q@Dutuk# 9(@Bp/q) kqrst. ^#5WO= @A{ uu) HFv@#e{ &? O=@A { \* Q@62. w9mx y p#3: \$Tq) \ : @D&' U m{ | 9} ~ ! x#] 6@e` cl @ D9BHEOF \$%) c#x\ : @D&' 9 ^@e) q-W' (! #x` T@A) \* & 9+\_-& J, \*. / U6789 @DFG21

LOOy) 6hi #. - g@D) q2e. / g] u6#( g' v- z@D9\* \$K) uT d19m) 2 ! BTU934@eX\*) Tq d50\_YXY<= #Tq@e) qU6VR @DUpn@7U

Lz @D) qD8\_ 9 91; uMWE F: ; <=Odefg#6789 @DFG? NO#( ) @' @D) qhi W! XY# ! O ^AP+! BC@D>D91 Lhi VEF GH Ohi Y#k@D) qHI ) F? ! U \ 2023 XR#: (@VyE; I 2J AP KDDc@D: ; I LhL& '# ( , C) 181M/ Nou@DOI LhL& '# ^t P4u@D) q9EF4; U

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Q) #OFz) \* +@DRS?VW9: %" zl h#n@Dno~62@DRSVW ?I &. / W@DMN+' PQW@DTU' S ( KVW@DX &+. " sof gU k 3#6789 @DFG Xum@Dn op^# KZ@DS' Wbc@DR; Wks \* D5Y@DWxs@D\$ZLH[ \ ? @D & h] OOy#z@Dno` Tu` yhcU ^O^H9W# @DFGs Wu6BC? 6\_ 9@D# \$% ( ) Z[ { S6BC5Y \* \* @BxW" #2BCaUFGFh9| H J #@A Dc b \$9@D# ` OF 9m) W M?KZU m9uk V^Dc +\* \$#9} \$z ^Z\ \* \* @BxW9@D(q) NO\$%#z@Dde ) G+U| 29) ( 2f ^f O( 9@D& ' # 5yq) gThW>?I m#Ri G9OF@D- ) j k W9@D#2yFi PW - ?BHI mE n\$BCmo9hGU79Y7#9) \$#@DQ ' ^f \* \*) { 9@>Z\ Ypq#n. Wr s f ^f 9: Upm o?7U z{ | \* 22}

? [ \ ] ^ \_ef gh



12H26I JKLMNPOQRSTUVWSXY Z[ \ ] ^\_ abcdefghij YKl mn o4p qrs Jt u! vwkl nxyz{ | }KLM[ ~ ! | "#K\$%&P' () \* QSYi +, - Z[ \ ] ^\_ Mc / #O12& 34b5 Q6789- . : ; <=& ! QR\$KMQR> # ?@ABCDEJ . ! YFGHaY! I o4?9. J KmL- ) i j YMN 10? &OPQN1RSJKI T&VWX! P' JYh' Z 1.5RM[ J' 2 80#i Z[ \ ] ^\_ ! YF 704A? (( ! ^\_ P aQShbcdel &11AGL ( f' ghcdj U ! QR\$! R?@A? ( ( Nkl Pj mncd&op q" #` R? ( ( Pj rscdt! r=cd. I Juv ] ! ^n; wxcd. I (vyz{ i | Z[ \ ] ^\_ V' WXNOP Q-ARST' U VW/X

t Y & DYZ[ \*h\ ] j5^ < \_habgcj

AC/eMz NO9\_ ; PQ: Mz - RG? : @AghSDcu^) WT#b | I X\* sU AS2GK2@%VCW{ efp/ #4dI X\* 2tef>?U Mz - RGQYz; L# SIMATS-KXz Y# AJ2p/ ; @2MK N. gZACX\* #1 3z OHF( , ?( J J; U SIMATS 9; # 22F# X\*m, J [ ^TGHWT#v? b | . OTk #@GAQ Topd~C? @hpGwXb2u466{ hp# 2; 120{ YN SIMATSUSIMATS\_5Ykw mk] ^) WT: ~C? @hpGdJ z 71 2) k\_2u" , b2v3qNE ) fg9hp#Prevedello abcU t 2023 X 1 ! Ex. dQ#hpC+ Ds1 hUl 2) e. e.SDf 1gNf 9^Pb8) 2F#G2nTh WT3: p#5{ | aFm\ Tq\$ZpJ z 2) 9LX =k Tb | #SIMATS 9/ ^ J1 m4dMX\* e| q9efU2; : ~C? @hpG29 SIMATS / ^N4k] #21=9 10{ SIMATS hp; #8{ 6 2N4f gUz 3# ZhJ 2F#VEfW^ ~n\* e. I C+? 4d+9[ oUp# @A

AI } Fef \ pq Moumita Koley \* 5^f SIMATS 9hp#Lr }ms a 64p#t i pW AIS>9U : ~C? @hpG2. Wu^ ^ Fhp/ ^ mv5p#2) U @AG: Mz - RGhCWTb | #p/ ^v wv v wux 2): Ky NOAz z 90%#v{ @BM2}: ( J? @| TOD . G^) 9, - UWT 2N# JV2)? ' Jg ZX\* nx\ 3<: yz#n" /~e\ 3I \* +/ ^#ACRe?!" &9kq( 6#U z 7' Jn8#hpW^~zO. KP \$e. I ? 4/ 9OFU> # %&^} \$1 9 \$A'; S Shrirsh Rao ke# Jm() \$^ { PubMed \* 49/ ^# 3n, pJ Rao) - 7# hpW^~m) 9+, #z km. : \$! sC Dp#d Al &5u" @, ` xS>Un. #u7 r} y! : \$MthL#z 3' efp/ T- yF2} + - U b2Vf/ ^z 2} Y7( W^, US 6#k/ qe. X\* - z hp/ ^+G. y Ouz 7ef X\* n8#b2hpTW^~n \* 2Re? 4dC+ #nH) 2ACJ; 9 KAOFU

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V' ~zWX ! }12! 25" #\$%& ' ( ) \* +, - . \$/ O- 1234567 89; < ) = >? ( @ABCDEF GII JK L @DFG MNOPQ" RSTUVW @ DFGN 2002 XOPSTI YZ078U D t # @DFG7 2022 XNo 78#u@ BZW ( @V Me f Rv #QwWe #x y 2z U3Q @DFG7 8# @ADE{ 2 R@BS6MO\* \$9P| #` a@D: ; bc9defg# ^t NO@D: ; bc 97\_ \$%? { qOE#( ) @Dbc\_Y XY# s@Dv- wx #\* &` @Dn o#Xs@Dmn+? a =S#Qo6" # @D) \* +bc#k{ | } ~ @BN! Ns HI ) &KLU ! : @DFG7 2002 XI PST#\* &Q o9( @D: ; " #bcU@BZ0^\$i % w) 2F# 307FZf g" E? { q" E#\* Ds t l J, - U ^WAw& w( 7) \* ^7@BS 6? @ADE 9\* \$p+U@w( 7) \* m\$# @ADE{ 2R@BS6MO\* \$9P| p# \$KF) ~ &, ] FG78' 53# \ ' i ? 1- ) #. @D: ; bc9{ qW / Wk W? Pi #k6" # @D: ; b

9: ; <= >? @ABCDEF G

V' ~zI J WXLKLM; ( @AI E I JI e gef qKL MM\*+ u^ - T7NO[ PQRS91Kt TUWVW# | ux YNOSH9: x#2XFub[ P' K WhYD9\* \$Z &#k' [ YE B[ P9N OVWHI uVGUO^ef >? ( b27 : | ^\_gu B: 6! l1 \ \ NO>3K] \_#( 6 I ET[ PH^] ! #M VR] NO[ P - V] \_VUB[ Py\_TabVt s\* 9] ! ^? x &#k DbLz B[ P9NOVW HI ucDUT7A^@!] ! 9VW81 z ] 3\* KNO#aduqi ! 9NO[ P QwC9] ! I \_U. 5# P QeS9N OVW\_V! KW#kCQcx) F) 3NO \_Vfyfgu

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89: ; <= >? 9: @ABCDEF

V' WX # \$%

( XY#9( 2R; TUh9?R; TU } Ft` 3; GOuLM\* \$>` # | G5 7HI 5J 9\* \$^KU R; TUWY9; H\_LM&9\* \$\_ | wh; ( Y9\* n. sg#1) ^N9fg 27R; TUb\* n. sgj; ( Y9u\* Os 9^N` WR; Tuu\* Os Up ( &3I I mW } Y9s( 1- +' OP, q- 4x nO2( " RD92024X( ) Y9s( +' >) pSTZ&R; TUS6bc\* - Ev WtU vwwxd; #1 VWNOSH x YK y 893U ! " # \$ % & https://doi.org/10.1002/adma.202411361

T 73#ef MM452NO[ PQR SEdgw\ g=hi j hr~\_Vi s i #7@OK CD40 ] \_HaCD40MP CpG/Y k u^ -YE B[ P91Kt q2PNO TUVW CM-CpG-aCD40UI VW640 YE2m 2?n\_V] n#45NO[ P QE9] ! R B[ Py\_8CWCd40 R CD408CWCpG R Toll=y\_98C#k B[ P HI q\* nt \$%# - B[ P9] - \ \ ?] ! ^oUCM-CpG-aCD40 ~x- pdR[ PA t # \ n?n CD8T[ P] 2\* q3NNO^Ur[ P] M12du2 /sKtu vwwxd; #1 VWNOSH x YK y 893U

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; sT& ' { 2TXde91 - CP#\$+, - { #2. // { { CQ` Up

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&36\* SR&XObc#9( ^7R; TU9, | ( 2z ObSO=U ^Oy#M64E9R; TU. 1R" 2` W 6! 3j4^Oy#( 7bc6\* S R&9R; TUBC?RS} O5| #KR; TUbC94>?3i K&+U 6v#8; # \ BC?RS>K& sT 9\* \$@>Z \ gO; sT 9, | Vm Tp>um@Tp#T TU[ Z \ / ] >W U^W U^W U^W; TU# \ I ER; B CTUU mOz n8#9} 2VOR; TURS? BC Oy TX: \$b&#9} \$>? \* + 23 &st Klbc6\* SR&9R; TUUm Q7U

& > ( ? @, AB5 CDEYF dGH | 2#9( R; TU9Yu69bc: AUnQke#WQ11XW9( R; TU) F t 91- X; 2#C+^NU9( Y9; ) \* +bc#z R; TURS? BC HeuT) 9 \$%#z) \* + ot R; TURS? BC / 9: ! %! ks < U Q2F#A( V=9: %#b) > 39 ( R; TU98\* K?@INNl o, \* 5pW } o, \* mUbUQ" W{ | R; TU8\* KO=INNl; TUX\_E) ot` A#CQ dR; TUW41dr; TUW BdR; T Unb>\; I oE} ot` AU ^Oy#41dR; TURS? BCX\_ { | } ot WJ ^: A9( R; TuBc9 41/ U m4^Oy#9} \$B; bC&+ #2) Bd R; TURS? BC} ot Oy{ | 1- dD{ { | N! Ns E2st } BdR; TU) ot 9| M#B> LM6bCUpnOs W#\\$ { | V f#b> I F{ R; TUx &k~ # SmR; TUS6\_L+ Topm>} >6G; R| ^Y9; R; BRsB TopJ nQ2F#( | R; TU) F t # NW +! I G; k 4\_WRAe\$, d#HC9R; TUBCS6\_L#B>N46xWt | ` 9R; TUBCS6qU G; W; sT W; TU) F t 94 \_U\$bst FR; TU5AG; #'& KZ> >6G; bc#` &P9st FR; TU| ` Y9R; BRU



! "

V' ~D @AGz; #~C? @hpG' | b2u^ { M| +9vpU2) 4qW ( ! " ! A#? @\$S Daniel Prevedello%; &9} ' eu^1 893i # ( ) \* 2+&q, 9Y\$?hpz\ Upt) - 7# e. I zhP9mv | hpm/ qO1UnV ^5123R ChatGPTO) &4xHAIM&59 bmoU6O^pJ 2 Prevedello P( ) 2+g) hp94 k! #78+ } u^9: ; 7\ U7\ Z[ < +u5ar 1! =#>^X\*93P' J21 2) Eb2um?) 969{ hppJ7\ L#Vf hp/ ^23nWX] q%9#m 9\* O^KpUVf hp/ ^~4du2tefJ9na p& UnVfeJ Rhp/ ^9' JYN> #AB\$A? BC@Aef gHSIMATSMU SIMATSs) >#CD9E@AI #2. p FGeHI kqj H} ACJ; U2023X#KL