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Ultrastrong and High Thermal Insulating Porous High-Entropy Ceramics up to 2000 °C

Zihao Wen, Zhongyu Tang, Yiyen Liu, Lei Zhuang, Hulei Yu, Yanhui Chu

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South China Univ of Tech Open URL

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Abstract

High mechanical load-carrying and high thermal insulating performance are crucial to thermal-insulation materials under extreme conditions. However, these features are often difficult to achieve simultaneously in conventional porous ceramics. Here, for the first time, it is reported a multiscale structure design and fast fabrication of 9-cation porous high-entropy diboride ceramics via an ultrafast high-temperature synthesis technique that can lead to exceptional mechanical load-bearing capability and high thermal insulation performance. With the construction of multiscale structures involving ultrafine pores at the microscale, high-quality interfaces between building blocks at the nanoscale, and severe lattice distortion at the atomic scale, the materials with an ≈50% porosity exhibit an ultra-high compressive strength of up to 227 MPa at 2000 °C.

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2311870

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Figures References Related Information

Recommended

Fabrication and properties of porous anorthite/mullite ceramics with both high porosity and high strength

1. Resistant to 2,000 degrees Celsius! SCUT developed an ultra-high-strength, high-thermal-insulating high-entropy porous ceramic material

2000

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6RXWK &KLQD 8QLYHUVLW\ RI 7HFKQRORJ\ 6&87 VXFFHVVIXOO\ GH
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2. SCUT scholars made new progress in NanoTAC technology for precise cancer treatment

NanoTAC

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SURWHLQ GHJUDGDWLRQ E\ PLPLFNLQJ VHOHFWLYH D ~~Nature~~ *Nature*
Nanotechnology. This publication introduces the NanoTAC technology, which is based on
multifunctional biomimetic nano-receptors. The study also highlights the remarkable progress made LQ
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 WKH SHQGLQJ)'\$ DSSURYDO QDQRGUXJ FDUULHU 3(* 3/\$ 7KH
 VHOIDVVHPEOLQJ ELRPLPHWLF QDQRUHFHSWRUV 15V WKDW PLPL
 KDYH ERWK D FRPSRQHqW IRU WDUJHWLQJ WKH GHVLUHGH SURWH
 FRPSRQHqW IRU HQKDQFLQJ GHJUDGDWLRQ FDWLRQLF OLSLG 7KH
 FDWLRQLF OLSLG VLPXOWDQHRXVO\ WDUJHWV DXWRSKDJRVRPHV
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3. The first "National Engineer Award" was presented! SCUT received recognition

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DQG WHFKQRORJLFDO VHOI UHOLDQFH DQG VHOI VWUHQJWKHQLOQ
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4.SCUT Guangzhou International Campus's first phase project received the Tien-yow Jeme Civil Engineering Prize

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LQWHUQDWLRQDO FROODERUDWLRQ DQG LV WKH ILUVW GRXEOL IL
WKH QHZ ,QWHUQDWLRQDOL]DWLRQ DW +RPH ,D+ PRGH ,W LV
*XDQJGRQJ +RQJ .RQJ 0DFDR *UHDWHU %D\ \$UHD IRU SULRULW\ GH
SKDVH SURMHFW ZKLFK KDV D WRWDO SODQQHG ODQG DUHD RI DEF
VT P SULPDULO\ FRQVLVWV RI VWDQGDORQH EXLOGHQJV V
FHQWHUV DQG GRUPLWRULHV DV ZHOO DV VXSSRUWLQJ PXQLFLSD
XQGHU WKH (3& PRGH ZLWK D WRWDO LQYHVWPHQW RI ELOOL
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E\ WKH 0LQLVWU\ RI +RXVLQJ DQG 8UEDQ 5XUDO 'HYHORSPHQW DQ
DQG 7HFKQRORJ\ LV RUJDQL]HG E\ WKH &KLQD &LYLO (QJLQHHUL
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Observation of single-molecule Raman spectroscopy enabled by synergic electromagnetic and chemical enhancement

Haiyao Yang, Haoran Mo, Jianzhi Zhang, Lihong Hong & Zhi-Yuan Li

Photonix 5, Article number: 3 (2024) | [Cite this article](#)

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Abstract

There has been a long fundamental pursuit to enhance and levitate the Raman scattering signal intensity of molecule by a huge number of ~14–15 orders of magnitude, to the level comparable with the molecule fluorescence intensity and truly entering the regime of single-

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Sections

Figures

Abstract

Introduction

Results

Discussion

Method

Availability of data and materials

References

5.Single-molecule Raman spectroscopy realized SCUT team put forward a new strategy for synergic electromagnetic and chemical enhancement

2Q)HEUXDU\ WKH WHDP OHG E\ 3URIHVVRU /L =KL\XDQ 6FKRRO
SXEOLVKHG WKH UHVHDUFK ILQGLQJV HQWLWOHG 2EVHUYDWLRQ RI
E\ 6\QHUJLF (OHFWURPDJQHWLF DQG &KHPLFDO (QKDQFHPHQW LQ
WKH ILHOG RI RSWLFV 7KLV UHVXOW UHDOL]HV VLQJOH PROHFHOR
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LQVHUWHG VLQJOH OD\HU WXQJVWHQ GLVXOILGH DEVRUELQJ 5KRGD
DQG PDWFKLQJ PROHFXOHV WR EH WHVWHG LQ RUGHU WR IRUP D 5
HOHFWURPDJQHWLF DQG FKHPLFDO HQKDQFHPHQW PHFKDQLVP (Y
PROHFXOHV LQ WKLV HQKDQFHG VXEVDUDWH LV DV ORZ DV H F
DQG WKH 5DPDQ VLJQDO RI D VLQJOH PROHFXOH FDQ EH GHWHFWHG
VXEVDUDWH KDV D VLP SOH VWUXFWXUH DQG WKH YDULRXV SDUWL
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6.SCUT students won women's doubles championship at 2024 German Open Badminton

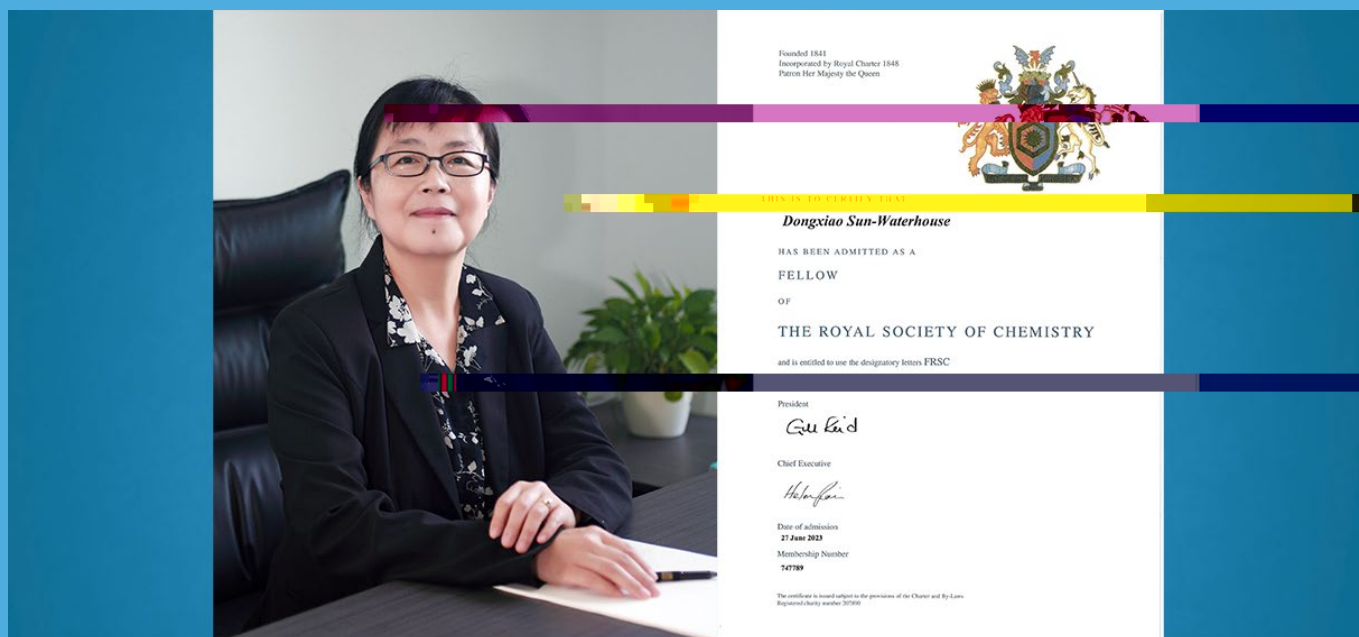
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7.Professor Sun Dongxiao, SCUT School of Food Science and Engineering elected as IAFoST
Fellow

Fellow

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Report View by Section						Customize
Total: 16	Research Fields	Web of Science Documents	Cites	Cites/Paper	Top Papers	
7	BIOCHEMISTRY	1,913	43,913	23.00	18	
8	ENVIRONMENT/ECOLOGY	2,015	45,469	22.57	36	
9	CLINICAL MEDICINE	2,139	27,097	12.67	22	
10	MOLECULAR BIOLOGY & GENETICS	606	14,378	23.73	6	
11	GEOSCIENCES	457	8,352	18.28	10	
12	MATHEMATICS	1,144	7,556	6.60	21	
13	PHARMACOLOGY & TOXICOLOGY	550	7,288	13.25	6	
14	SOCIAL SCIENCES, GENERAL	526	6,362	12.10	13	
15	PLANT & ANIMAL SCIENCE	278	3,509	12.62	1	
0	ALL FIELDS	57,680	1,287,595	22.32	1,106	

8. Breakthroughs made in the construction of SCUT science and engineering disciplines

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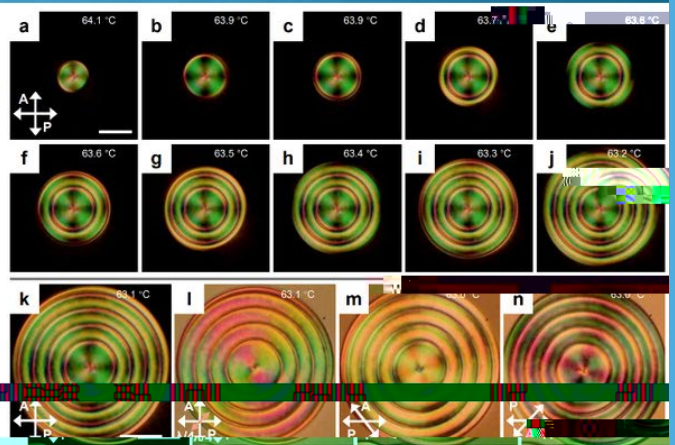
Flexoelectricity-driven toroidal polar topology in liquid-matter helielectricsJidan Yang, Yu Zou, Jinxing Li, Mingjun Huang  & Satoshi Aya 

Nature Physics (2024) | Cite this article

519 Accesses | 2 Altmetric | Metrics

Abstract

Magnetic and electric dipoles have similar symmetry and are therefore expected to exhibit many common structures. However, despite frequent reports of various spin textures



9. SCUT team discovered and resolved novel electrically polarized topological structure in liquid ferroelectric nematics

7KH UHVHDFK WHDP OHG E\ 6DWRVKL \$\D DQG 0LQJMXQ +XDQJ IUR
6&87 KDV PDGH D PDMRU EUHDNWKURXJK LQ IHUURHOHFWULF QHPD
1DWXUH 3K\VLV ZLWK WKH WLWOH RI)OH[RHOHFWULFLW\ GULY
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GHHSHQLQJ WKH XQGHUVWDQGLQJ RI WRSRORJLFDO VWUXFWXUH IR
LW DOVR SURYLGHV WKHRUHWLFDO JXLGDQFH DQG H[SHULPHQWD
RSWRHOHFWURQLF GHYLFHV ,Q SDUWLFXODU WKH XQLTXH GV
FKDUDFWHULVWLFV RI WKH SRODUL]HG WRURLGDO GRPDLQ UHJLRQ
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10. Promoting the application of hyperspectral imaging technology in the food industry
Academician Sun Dawen published a paper in *Nature*

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 UHYLSHDSHIQWLWSSHGLFBRWKLBRQVVSHPWJLQDFKQLQPKIRRGQG XVDWVKH
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 IRU QHZ UHVHDUFKHUV DQG QRQ SURIHVVLRQDO ZRUNHUV LQ WKLV
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