

# Chinese Physics B

Volume 33 Number 6 June 2024

## Contents

### TOPICAL REVIEW — Valleytronics

**067303 Gate-field control of valley polarization in valleytronics**

Ting-Ting Zhang, Yilin Han, Run-Wu Zhang and Zhi-Ming Yu

### TOPICAL REVIEW — States and new effects in nonequilibrium

**066402  $K$ -core attack, equilibrium  $K$ -core, and kinetically constrained spin system**

Hai-Jun Zhou

### SPECIAL TOPIC — Heat conduction and its related interdisciplinary areas

**064401 Theoretical study on the effective thermal conductivity of silica aerogels based on a cross-aligned and cubic pore model**

Kuncan Zheng, Zhendong Li, Yutong Cao, Ben Liu and Junlei Hu

### INSTRUMENTATION AND MEASUREMENT

**060701 Imaging plate scanners calibration and the attenuation behavior of imaging plate signals**

Nan Bo and Nai-Yan Wang

### RAPID COMMUNICATION

**060702 Controlling the dynamic behavior of decentralized cluster through centralized approaches**

Daming Yuan, Peilong Wang, Peng Wang, Xingyu Ma, Chuyun Wang, Jing Wang, Huaicheng Chen, Gao Wang and Fangfu Ye

**067103 Anisotropic metal–insulator transition in strained  $\text{VO}_2(\text{B})$  single crystal**

Zecheng Ma, Shengnan Yan, Zenglin Liu, Tao Xu, Fanqiang Chen, Sicheng Chen, Tianjun Cao, Litao Sun, Bin Cheng, Shi-Jun Liang and Feng Miao

**067104 Unveiling the pressure-driven metal–semiconductor–metal transition in the doped  $\text{TiS}_2$**

Jiajun Chen, Xindeng Lv, Simin Li, Yaqian Dan, Yanping Huang and Tian Cui

**067301 Field induced Chern insulating states in twisted monolayer–bilayer graphene**

Zhengwen Wang, Yingzhuo Han, Kenji Watanabe, Takashi Taniguchi, Yuhang Jiang and Jinhai Mao

**067302 Reanalysis of energy band structure in the type-II quantum wells**

Xinxin Li, Zhen Deng, Yang Jiang, Chunhua Du, Haiqiang Jia, Wenxin Wang and Hong Chen

**067401 Revisit of the anisotropic vortex states of  $2\text{H-NbSe}_2$  towards the zero-field limit**

Fan Zhang, Xingyuan Hou, Yuxuan Jiang, Zongyuan Zhang, Yubing Tu, Xiangde Zhu, Genfu Chen and Lei Shan

*(Continued on the Bookbinding Inside Back Cover)*

**067402 Surface doping manipulation of the insulating ground states in  $\text{Ta}_2\text{Pd}_3\text{Te}_5$  and  $\text{Ta}_2\text{Ni}_3\text{Te}_5$**   
Bei Jiang, Jingyu Yao, Dayu Yan, Zhaopeng Guo, Gexing Qu, Xiutong Deng, Yaobo Huang, Hong Ding, Youguo Shi, Zhijun Wang and Tian Qian

**067501 Semiclassical approach to spin dynamics of a ferromagnetic  $S = 1$  chain**  
Chengchen Li, Yi Cui, Weiqiang Yu and Rong Yu

**067503 Relationship between disorder, magnetism and band topology in  $\text{Mn}(\text{Sb}_{1-x}\text{Bi}_x)_2\text{Te}_4$  single crystals**  
Ming Xi and Hechang Lei

**067801 Photoinduced Floquet higher-order Weyl semimetal in  $C_6$  symmetric Dirac semimetals**  
Xin-Xin Xu, Zi-Ming Wang, Dong-Hui Xu and Chui-Zhen Chen

### GENERAL

**060201 Multi-soliton solutions, breather-like and bound-state solitons for complex modified Korteweg–de Vries equation in optical fibers**  
Zhong-Zhou Lan

**060202 Mechanism analysis of regulating Turing instability and Hopf bifurcation of malware propagation in mobile wireless sensor networks**  
Xi-Xi Huang, Min Xiao, Leszek Rutkowski, Hai-Bo Bao, Xia Huang and Jin-De Cao

**060203 Performance enhancement of a viscoelastic bistable energy harvester using time-delayed feedback control**  
Mei-Ling Huang, Yong-Ge Yang and Yang Liu

**060301 Mobility edges and localization characteristics in one-dimensional quasiperiodic quantum walk**  
Xin-Hui Cui, Hui-Min Wang and Zhi-Jian Li

**060302 Anomalous time-reversal symmetric non-Hermitian systems**  
Yifei Yi

**060303 Quantum discord and its dynamics for multipartite systems**  
Jiaxin Luo and Qiong Guo

**060304 Enhancing quantum metrology for multiple frequencies of oscillating magnetic fields by quantum control**  
Xin Lei, Jingyi Fan and Shengshi Pang

**060305 Topological laser on square lattice with gain–loss-induced higher-order corner modes**  
Ming-Jie Liao, Mei-Song Wei, Shuailing Wang, Jingping Xu and Yaping Yang

**060306 Robust optical mode converter based on topological waveguide arrays**  
Yu-Xiang Xu, Wen-Jian Tang, Li-Wei Jiang, De-Xing Wu, Heng Wang, Bing-Cong Xu and Lin Chen

- 060307 Wigner function of optical cumulant operator and its dissipation in thermo-entangled state representation**  
Ke Zhang, Lan-Lan Li and Hong-Yi Fan
- 060308 Exceptional points and quantum dynamics in a non-Hermitian two-qubit system**  
Yi-Xi Zhang, Zhen-Tao Zhang, Zhen-Shan Yang, Xiao-Zhi Wei and Bao-Long Liang
- 060309 A quantum blind signature scheme based on dense coding for non-entangled states**  
Ke Xing, Ai-Han Yin and Yong-Qi Xue
- 060310 Design of a novel hybrid quantum deep neural network in INEQR images classification**  
Shuang Wang, Ke-Han Wang, Tao Cheng, Run-Sheng Zhao, Hong-Yang Ma and Shuai Guo
- 060311 Interplay between topology and localization on superconducting circuits**  
Xin Guan, Bingyan Huo and Gang Chen
- 060312 Electric field dependence of spin qubit in a Si-MOS quantum dot**  
Rong-Long Ma, Ming Ni, Yu-Chen Zhou, Zhen-Zhen Kong, Gui-Lei Wang, Di Liu, Gang Luo, Gang Cao, Hai-Ou Li and Guo-Ping Guo
- 060313 Nonlinearly induced entanglement in dissipatively coupled optomechanical system**  
Wen-Quan Yang, Xuan Leng, Jiong Cheng and Wen-Zhao Zhang
- 060314 Decoding topological  $XYZ^2$  codes with reinforcement learning based on attention mechanisms**  
Qing-Hui Chen, Yu-Xin Ji, Ke-Han Wang, Hong-Yang Ma and Nai-Hua Ji
- 060401 Triple points and phase transitions of  $D$ -dimensional dyonic AdS black holes with quasi-topological electromagnetism in Einstein–Gauss–Bonnet gravity**  
Ping-Hui Mou, Qing-Quan Jiang, Ke-Jian He and Guo-Ping Li
- 060501 Kármán vortex street in a spin–orbit-coupled Bose–Einstein condensate with PT symmetry**  
Kai-Hua Shao, Bao-Long Xi, Zhong-Hong Xi, Pu Tu, Qing-Qing Wang, Jin-Ping Ma, Xi Zhao and Yu-Ren Shi
- 060502 Extensive numerical simulations on competitive growth between the Edwards–Wilkinson and Kardar–Parisi–Zhang universality classes**  
Chengzhi Yu, Xiao Liu, Jun Tang and Hui Xia
- 060503 Effects of asymmetric coupling and boundary on the dynamic behaviors of a random nearest neighbor coupled system**  
Ling Xu and Lei Jiang
- 060504 Two innovative equivalent statements of the third law of thermodynamics**  
Xiaohang Chen, Yinghui Zhou and Jincan Chen

**060703 Performance optimization of a SERF atomic magnetometer based on flat-top light beam**  
Ziqi Yuan, Junjian Tang, Shudong Lin and Yueyang Zhai

**ATOMIC AND MOLECULAR PHYSICS**

**063201 Manipulating the electron dynamics in the non-sequential double ionization process of Ar atoms by an orthogonal two-color laser field**  
Pengzhao Wang, Lijie Qian, Zhenrong Sun and Yan Yang

**063401 Entropy of deterministic trajectory via trajectories ensemble**  
Yonggang Peng, Cuiping Ran and Yujun Zheng

**063402 Optimal preparation of Bose and Fermi atomic gas mixtures of  $^{87}\text{Rb}$  and  $^{40}\text{K}$  in a crossed optical dipole trap**  
Peibo Ding, Biao Shan, Yuhang Zhao, Yajing Yang, Liangchao Chen, Zengming Meng, Pengjun Wang and Lianghai Huang

**ELECTROMAGNETISM, OPTICS, ACOUSTICS, HEAT TRANSFER, CLASSICAL MECHANICS, AND FLUID DYNAMICS**

**064101 Divergence angle consideration in energy spread measurement for high-quality relativistic electron beam in laser wakefield acceleration**  
Guang-Wei Lu, Yao-Jun Li, Xi-Chen Hu, Si-Yu Chen, Hao Xu, Ming-Yang Zhu, Wen-Chao Yan and Li-Ming Chen

**064201 Robust autofocusing propagation in turbulence**  
Na-Na Liu, Liu Tan, Kai-Jian Chen, Pei-Long Hong, Xiao-Ming Mo, Bing-Suo Zou, Yu-Xuan Ren and Yi Liang

**064202 Frequency-tunable single-photon router based on a microresonator containing a driven three-level emitter**  
Jin-Song Huang, Jing-Lan Hu, Yan-Ling Li and Zhong-Hui Xu

**064203 Optical PAM-4/PAM-8 generation via dual-Raman process in Rydberg atoms**  
Xiao-Yun Song, Zheng Yin, Guan-Yu Ren, Ming-Zhi Han, Ai-Hong Yang, Yi-Hong Qi and Yan-Dong Peng

**064204 Effects of cross-Kerr coupling on transmission spectrum of double-cavity optomechanical system**  
Li-Teng Chen, Li-Guo Qin, Li-Jun Tian, Jie-Hui Huang, Nan-Run Zhou and Shang-Qing Gong

**064205 Intrinsic polarization conversion and avoided-mode crossing in X-cut lithium niobate microrings**  
Zelin Tan, Jianfa Zhang, Zhihong Zhu, Wei Chen, Zhengzheng Shao, Ken Liu and Shiqiao Qin

**064301 Non-Kramers doublet ground state in a quaternary cubic compound  $\text{PrRu}_2\text{In}_2\text{Zn}_{18}$  investigated by ultrasonic measurements**

Hua-Yuan Zhang, Kazuhei Wakiya, Mitsuteru Nakamura, Masahito Yoshizawa and Yoshiki Nakanish

**064501 Effect of speed humps on instantaneous traffic emissions in a microscopic model with limited deceleration capacity**

Yu-Chen Hu, Qi-Lang Li, Jun Liu, Jun-Xia Wang and Bing-Hong Wang

**064701 Morphological analysis for thermodynamics of cavitation collapse near fractal solid wall**  
Minglei Shan, Yu Yang, Xuefen Kan, Cheng Yin and Qingbang Han

**064702 On the spreading behavior of a droplet on a circular cylinder using the lattice Boltzmann method**

Fan Yang, Hu Jin and Mengyao Dai

#### **PHYSICS OF GASES, PLASMAS, AND ELECTRIC DISCHARGES**

**065201 Global dust density in two-dimensional complex plasma**

Yi-Zhen Zhao, Song-Fen Liu, Wei Kong and Fang Yang

**065202 Effects of diamagnetic drift on nonlinear interaction between multi-helicity neoclassical tearing modes**

Haiyuan Wang, Shuai Jiang, Tong Liu, Lai Wei, Qibin Luan and Zheng-Xiong Wang

**065203 Velocity analysis of supersonic jet flow in double-cone ignition scheme**

Zhong-Yuan Zhu, Cheng-Long Zhang and Ying-Jun Li

#### **CONDENSED MATTER: STRUCTURAL, MECHANICAL, AND THERMAL PROPERTIES**

**066101 Wafer-scale  $30^\circ$  twisted bilayer graphene epitaxially grown on  $\text{Cu}_{0.75}\text{Ni}_{0.25}$  (111)**

Peng-Cheng Ma, Ao Zhang, Hong-Run Zhen, Zhi-Cheng Jiang, Yi-Chen Yang, Jian-Yang Ding, Zheng-Tai Liu, Ji-Shan Liu, Da-Wei Shen, Qing-Kai Yu, Feng Liu, Xue-Fu Zhang and Zhong-Hao Liu

**066401 Pressure-induced magnetic phase and structural transition in  $\text{SmSb}_2$**

Tao Li, Shuyang Wang, Xuliang Chen, Chunhua Chen, Yong Fang and Zhaorong Yang

**066801 Influences of divalent ion substitution on the magnetic and dielectric properties of W-type barium ferrite**

Shiyue He, Ruoshui Liu, Xujie Liu, Xianping Ye, Lichen Wang and Baogen Shen

**066802 Superconducting state in  $\text{Ba}_{(1-x)}\text{Sr}_x\text{Ni}_2\text{As}_2$  near the quantum critical point**

Chengfeng Yu, Zongyuan Zhang, Linxing Song, Yanwei Wu, Xiaoqiu Yuan, Jie Hou, Yubing Tu, Xingyuan Hou, Shiliang Li and Lei Shan

**CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES**

**067101 Magnetism, heat capacity, magnetocaloric effect, and magneto-transport properties of heavy fermion antiferromagnet CeGaSi**

Li-Bo Zhang, Qing-Xin Dong, Jian-Li Bai, Qiao-Yu Liu, Jing-Wen Cheng, Cun-Dong Li, Pin-Yu Liu, Ying-Rui Sun, Yu Huang, Zhi-An Ren and Gen-Fu Chen

**067102 Discovery of controllable high Chern number quantum anomalous Hall state in tetragonal lattice FeSiIn**

Xiao-Lang Ren and Chang-Wen Zhang

**067502 Consistency between domain wall oscillation modes and spin wave modes in nanostrips**  
Xinwei Dong and Zhenjiang Wu

**067601 Low-energy spin dynamics in a Kitaev material  $\text{Na}_3\text{Ni}_2\text{BiO}_6$  investigated by nuclear magnetic resonance**

Xinyu Shi, Yi Cui, Yanyan Shangguan, Xiaoyu Xu, Zhanlong Wu, Ze Hu, Shuo Li, Kefan Du, Ying Chen, Long Ma, Zhengxin Liu, Jinsheng Wen, Jinshan Zhang and Weiqiang Yu

**067701 Observing ferroelastic switching in  $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$  thin film**

Zhao Guan, Tao Wang, Yunzhe Zheng, Yue Peng, Luqi Wei, Yuke Zhang, Abliz Mattursun, Jiahao Huang, Wen-Yi Tong, Genquan Han, Binbin Chen, Ping-Hua Xiang, Chun-Gang Duan and Ni Zhong

**INTERDISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY**

**068101 Linear dichroism transition and polarization-sensitive photodetector of quasi-one-dimensional palladium bromide**

Wan-Li Zhu, Wei-Li Zhen, Rui Niu, Ke-Ke Jiao, Zhi-Lai Yue, Hui-Jie Hu, Fei Xue and Chang-Jin Zhang

**068102 Synthesis and nitrogen content regulation of diamond in a high-pressure hydrogen-rich environment**

Guofeng Huang, Liangchao Chen and Chao Fang

**068103 Effect of trace oxygen on plasma nitriding of titanium foil**

Hai-Tao Zhou, Xi-Ya Xiong, Ke-Xin Ma, Bing-Wei Luo, Fei Luo and Cheng-Min Shen

**068104 Bimodal growth of Fe islands on graphene**

Yi-Sheng Gu, Qiao-Yan Yu, Dang Liu, Ji-Ce Sun, Rui-Jun Xi, Xing-Sen Chen, Sha-Sha Xue, Yi Zhang, Xian Du, Xu-Hui Ning, Hao Yang, Dan-Dan Guan, Xiao-Xue Liu, Liang Liu, Yao-Yi Li, Shi-Yong Wang, Can-Hua Liu, Hao Zheng and Jin-Feng Jia

**068301 A pressure-sensitive rheological origin of high friction angles of granular matter observed in NASA–MGM project**

Xiaohui Cheng, Shize Xiao, Sen Yang, Naifeng Zhao and Alex Sixie Cao

**068401 One memristor–one electrolyte-gated transistor-based high energy-efficient dropout neuronal units**

Yalin Li, Kailu Shi, Yixin Zhu, Xiao Fang, Hangyuan Cui, Qing Wan and Changjin Wan

**068402 Rational molecular engineering towards efficient heterojunction solar cells based on organic molecular acceptors**

Kaiyan Zhang, Peng Song, Fengcai Ma and Yuanzuo Li

**068501 Optimize Purcell filter design for reducing influence of fabrication variation**

Xiao Cai, Yi-Biao Zhou, Wen-Long Yu, Kang-Lin Xiong and Jia-Gui Feng

**068502 Fully spin-polarized, valley-polarized and spin-valley-polarized electron beam splitters utilizing zero-line modes in a three-terminal device**

Xiao-Long Lü, Jia-En Yang and Hang Xie

**068701 Factors resisting protein adsorption on hydrophilic/hydrophobic self-assembled monolayers terminated with hydrophilic hydroxyl groups**

Dangxin Mao, Yuan-Yan Wu and Yusong Tu

**068702 Coexisting fast–slow dendritic traveling waves in a 3D-array electric field coupled neuronal network**

Xile Wei, Zeyu Ren, Meili Lu, Yaqin Fan and Siyuan Chang

#### **CORRIGENDUM**

**069901 Corrigendum to “Numerical studies of atomic three-step photoionization processes with non-monochromatic laser fields”**

Xiaoyong Lu, Lide Wang and Yunfei Li