

## BIOGRAPHY



**Gufei Zhang**

**Institute of Experimental  
Physics SAS**

**Project number  
IM-2024-121**

**Project duration  
7.1.2026-31.12.2030**

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*"The IMPULZ Fellowship is a valuable and powerful instrument for me to tackle challenges at the forefront of quantum physics and technology through in-house collaborations with a number of distinguished scientists at IEP SAS."*

Dr. Gufei Zhang earned his PhD degree in physics from KU Leuven in Belgium. His expertises fall within the wide spectrum of quantum materials, condensed matter physics, and nanotechnology, and his efforts have been mainly devoted to the exploration and investigation of quantum phenomena in diamond and other advanced electronic materials [1-5]. His track record of achievements is demonstrated by a number of publications in top-tier journals such as Science Advances, Nature Communications, PRL, Advanced Materials, ACS Nano, Advanced Functional Materials, Carbon, ACS Catalysis, etc. In 2014, Dr. Zhang was selected as an FWO Fellow by the Flemish Government of Belgium. In 2017, he was awarded the Seal of Excellence by the Marie Skłodowska-Curie Action of the European Commission. In 2018, he was appointed as a D-IAS assistant professor by the Danish Institute for Advanced Study. In 2023, he received the Zhongyuan Talent Award from the Provincial Government of Henan in China. In 2025, he was conferred an Excellent Author Award by Wiley. Thrilled by his recently obtained IMPULZ Fellowship, Dr. Zhang considers it a valuable and powerful instrument for him to tackle challenges at the forefront of quantum physics and technology through in-house collaborations with a number of distinguished scientists at IEP-SAS, with whom he has collaborated remotely for a decade. Supported by the IMPULZ grant, he is building up a group with its focus on Quantum nano MAterials and DEvices (Q-MADE) at the Centre of Low Temperature Physics. He is preparing to raise funds from foreign funding bodies such as Horizon Europe and ERC for bringing the impact of his research beyond the scope and the lifetime of the IMPULZ project and growing his research group. Apart from leading to breakthroughs in condensed matter physics and quantum physics, Dr. Zhang's research on diamond may also aid in the sustainable development of the semiconductor and microelectronics industries of the region and nation.

### Spin Injection into Diamond for Quantum Magnetolectronics

Apart from its demonstrated superior performance in upgrading the semiconductor industry in the post-silicon era, diamond shows great promise for promoting the ongoing quantum revolution by being a disruptive material with some of the most exotic physical properties which cannot be described or explained in terms of classical or semiclassical physics.

Recently, proof-of-concept experiments have demonstrated the presence of a series of exotic magnetolectronic phenomena (i.e., coexistent superconductivity and ferromagnetism, a giant positive magnetoresistance, and long-range coherent magnetic bound states) in diamond, yet the microscopic mechanisms of these phenomena remain elusive, preventing them from being exploited for quantum applications.

In the framework of this project, recent advances in diamond growth technology will be combined with state-of-the-art manufacturing processes to establish viable paths towards controlled spin injection into this material. By tuning the quantum coupling between different properties of electrons in diamond, we will elucidate the hitherto concealed microscopic mechanisms of the newly discovered magnetolectronic phenomena. The tunable realization of these phenomena will provide a rich phenomenology for the development of innovative devices such as magnetic-field sensors in the tesla range and topologically protected qubits for quantum computing.



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## TOP 5 PUBLICATIONS

1. G. Zhang\*, R. Zulkharnay, X. Ke\*, M. Liao\*, L. Liu, Y. Li, V. V. Moshchalkov & P. W. May –  
“Unconventional Giant ‘Magnetoresistance’ in Bosonic Semiconducting Diamond Nanorings”  
ISSN: 1521-4095, DOI: 10.1002/adma.202211129  
[Advanced Materials 35, 2211129 \(2023\)](#)
2. G. Zhang\*, T. Samuely\*, N. Iwahara\*, J. Kačmarčík, C. Wang, P. W. May, J. Jochum, O. Onufriienko, P. Szabó, S. Zhou, P. Samuely, V. Moshchalkov, L. Chibotaru\* & H. Rubahn –  
“Yu-Shiba-Rusinov Bands in Ferromagnetic Superconducting Diamond” – ISSN: 2375-2548, DOI: 10.1126/sciadv.aaz2536  
[Science Advances 6, eaaz2536 \(2020\)](#)
3. G. Zhang\*, T. Samuely, Z. Xu, J. Jochum, A. Volodin, S. Zhou, P. W. May, O. Onufriienko, J. Kačmarčík, J. Steele, J. Li, J. Vanacken, J. Vacík, P. Szabó, H. Yuan, M. Roeffaers, D. Cerbu, P. Samuely, J. Hofkens & V. Moshchalkov\* –  
“Superconducting Ferromagnetic Nanodiamond” – ISSN: 1936-0851, DOI: 10.1021/acsnano.7b01688  
[ACS Nano 11, 5358 \(2017\)](#)
4. G. Zhang\*, S. Turner, E. Ekimov, J. Vanacken, M. Timmermans, T. Samuely, V. Sidorov, S. Stishov, Y. Lu, B. Deloof, B. Goderis, G. Van Tendeloo, J. Van De Vondel & V. V. Moshchalkov\* –  
“Global and Local Superconductivity in Boron-Doped Granular Diamond” – ISSN: 1521-4095, DOI: 10.1002/adma.201304667  
[Advanced Materials 26, 2034 \(2014\)](#)
5. G. Zhang\*, M. Zeleznik, J. Vanacken, P. W. May & V. Moshchalkov\* –  
“Metal-Bosonic Insulator-Superconductor Transition in Boron-Doped Granular Diamond” – ISSN: 1079-7114, DOI: 10.1103/PhysRevLett.110.077001  
[Physical Review Letters 110, 077001 \(2013\)](#)



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