

Call for Proposals

No. 36

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Priority Programme “Perovskite Semiconductors: From Fundamental Properties to Devices” (SPP 2196)

In March 2018, the Senate of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) established the Priority Programme “Perovskite Semiconductors: From Fundamental Properties to Devices” (SPP 2196). The programme is designed to run for six years. The present call invites proposals for the first three-year funding period.

This Priority Programme focusses on the new class of hybrid organic-inorganic lead halide perovskite semiconductors, which have attracted global attention since the first reports on high efficiency perovskite solar cells in mid-2012. Within only a few years, power conversion efficiency surpassing 23 percent has been achieved. Despite rapid progress in this emerging field, it remains unclear why in particular this material class works so exceptionally well in solar cells and which underlying basic mechanisms lead to this extraordinary performance. Currently, because of continuing optimisation strategies, the formerly simple perovskite structure is becoming increasingly complex with respect to, both, composition and dimensionality. This leads to more open questions regarding e.g. fundamental processes, phase stability, and interface behaviour. Moreover, the degradation mechanisms and the role of some of the constituent, especially lead, in high performing devices are not understood.

The main objective of this Priority Programme is to bridge the gap between the application of perovskites, mainly in solar cells, and the corresponding fundamental research on this semiconductor regarding correlations between, e.g., structural, optical, electronic, or magnetic properties. Notably, this research topic is highly interdisciplinary in nature, bridging chemistry, material science, device engineering, and physics. The programme is aimed to intensify collaborations between different groups and disciplines, theory and experiment, as well as to bundle top-expert knowledge. Therefore, it is the intention that every project participating in this programme should have at least two principal investigators (PI) coming together from different institutions that can contribute distinct and complementary research expertise. Involvement of young and female investigators as PI in the consortia will be explicitly encouraged. Some selected key areas that will be covered, both in experiment and theory, are listed below; ideally, at least two of these focus areas should be covered:

- effects of dimensionality (single crystals, 3D, 2D, 1D, 0D) and composition tuning
- role of lead and possible alternatives
- intrinsic degradation mechanisms
- role of interfaces
- defects, defect tolerance, and doping

- charge carrier dynamics, recombination, and transport
- role of ferroelectricity and ionicity
- spin effects/spin-orbit coupling

The Priority Programme aims to provide a comprehensive understanding of the fundamental properties of perovskite materials and their role for devices. Therefore, commercial aspects such as large-scale production or improved extrinsic stability using encapsulation technologies will not be taken into account. Furthermore, the mere screening of material combinations in devices without the generation of fundamental understanding is discouraged as is the research on non-semiconducting perovskites, i.e. oxide structures.

Proposals must be submitted to the DFG by **30 October 2018** via elan, the DFG's electronic proposal processing system. To submit a proposal, go to Proposal Submission – New Project/Draft Proposal – Priority Programmes and select “SPP 2196” from the current list of calls.

All proposals have to be written in English and prepared according to the programme guidelines (form 50.05, section B) and the proposal preparation instructions (form 54.01). These forms can either be downloaded from our website or accessed through the elan portal.

Applicants must be registered in elan prior to submitting a proposal to the DFG. Please make sure that all applicants of your project have done so before **16 October 2018**. You will normally receive confirmation of your registration by the next working day. Note that you will be asked to select the appropriate Priority Programme call during both the registration and the proposal process.

The evaluation workshop will take place on 31 January & 1 February 2019 in the Physik-Zentrum in Bad Honnef.

Further Information

More information on the Priority Programme is available under:
www.perovskite-research.de

The elan system can be accessed at:
<https://elan.dfg.de/en>

DFG forms 50.05 and 54.01 can be downloaded at:
www.dfg.de/formulare/50_05
www.dfg.de/formulare/54_01

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