

# Recent Advances in Diamond Science and Technology: From Quantum Fundamentals to Materials and Applications.

We are pleased to present this Special Issue of *Physica status solidi (a)* showcasing exciting research in the field of “Diamond Science and Technology”. In particular, it relates to the main topic of the 26<sup>th</sup> edition of the international Surface and Bulk Defects in Diamond (SBDD) workshop featuring all the aspects of diamond research. Diamond is an attractive material not only for fundamental science but also for innovative applications such as quantum technologies, sensors, nanoscale chemical and biomedical imaging, as well as applications in green and sustainable technologies. Further on, it is the material addressed in the major future research directions of the EU programmes Quantum Technologies Flagship and Quantum Communication Infrastructure. Diamond relies on unique properties and the existence of colour centres such as the NV, the SiV and other group IV vacancy centres. These not only can be used for sensing magnetic and electric fields but also for quantum information technology. However, progress in this field relies on substantial advances in the production of highly controlled diamond materials with low defect density using chemical vapour deposition (CVD) or high pressure high temperature (HPHT) techniques. Besides that, an ultimate control of the material electronic properties is required, in other application fields, for the development of diamond based high-power devices.

To achieve these goals and requirements researchers are developing and optimizing reactors for diamond epitaxy aiming at highly scalable and reproducible processes for quantum devices based on diamond, as well as analysing in-depth the gas dynamics inside the reactors for a better control and optimization of the growth parameters. All of this is followed by in-depth materials analysis, where the improvement of characterization techniques is essential for further advancement in the fascinating research field of diamond. All of this and more can be found in this Special Issue on “Diamond Science and Technology.”

The 26<sup>th</sup> SBDD workshop was held in March 2022 in Hasselt (Belgium), it happened to be one of the first conferences, and the first one of the diamond community, held after the pandemic situation that again enabled personal meetings, scientific exchanges and interactions.

Hasselt, February 2023.

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DOI: 10.1002/pssa.202300051