*physica status solidi (a)*

GUEST EDITORIAL

# Recent Advances in Diamond Science and Technology

Quan Li[1,2,3] | Paulius Pobedinskas[4,5]

[1]Department of Physics, The Chinese University of Hong Kong, Shatin, New TerritoriesHong Kong, China | [2]Centre for Quantum Coherence, The Chinese University of Hong Kong, Shatin, New TerritoriesHong Kong, China | [3]State Key Laboratory of Quantum Information Technologies and Materials, The Chinese University of Hong Kong, Shatin, New TerritoriesHong Kong, China | [4]Institute for Materials Research (IUMAT), Hasselt University, Diepenbeek, Belgium | [5]IUMAT, IMEC, Diepenbeek, Belgium

**Correspondence:** Paulius Pobedinskas (paulius.pobedinskas@uhasselt.be)

**Received:** 5 February 2026 | **Revised:** 17 February 2026 | **Accepted:** 19 February 2026

We are pleased to present this Topical Section of *Physica Status Solidi* (*a*), highlighting the latest advancements in diamond science and technology through a collection of peer-reviewed articles originating from the 29th edition of the international Surface and Bulk Defects in Diamond (SBDD XXIX) workshop. Held in March 2025 in Hasselt, Belgium, this workshop continued its long-standing tradition of serving as a primary forum for the global diamond community to discuss the evolution of the field from fundamental defect physics toward sophisticated material engineering.

A centerpiece of this issue is the invited review paper by Julie Widiez, which details the adaptation of the Smart Cut layer transfer process to diamond. This is a milestone for a material traditionally known for being difficult to fabricate in large, cost-effective formats. By ingeniously turning diamond's metastable nature into a technical advantage, the work demonstrates how a buried $sp^2$-rich layer can be created through finely tuned ion implantation to serve as a precise fracture plane, significantly reducing the thermal budget required for cleavage. This process enabled the successful transfer of an 800-nm-thick diamond film onto a silicon substrate via metal bonding, preserving high crystalline quality. This achievement marks a pivotal step toward providing "epi-ready" diamond substrates on engineered hosts, paving a scalable path for high-performance electronics and quantum technologies.

Complementing this central review, the Topical Section features a diverse range of papers that address the broader challenges of diamond synthesis, characterization, and application. The collection explores advanced substrate engineering, including studies on strain effects in bonded diamond-on-insulator layers and the optical investigation of isotopically enriched $^{12}C$ diamond films, alongside experimental insights into impurity incorporation during CVD growth. The rapid maturation of diamond-based quantum hardware is also well-represented, with research focusing on achieving high coherence times in nitrogen-vacancy-doped films and the strategic placement of color centers for sensing applications. These technological developments are underpinned by fundamental spectroscopic studies that probe defect ionization energies and absorption cross-sections with unprecedented resolution. Furthermore, the issue highlights diamond's expanding role in electronics and biochemistry, featuring work on the fabrication of conductive graphitic layers via focused ion beams, the analysis of hopping conduction in heavily boron-doped single crystals, and the development of nanodiamond-based electrochemical sensors for health monitoring.

Together, these contributions illustrate a field that is no longer merely observing diamond's extreme properties but is now masterfully tailoring them for real-world integration. We would like to thank the authors for their insightful contributions and the reviewers for their dedication to maintaining the high standards of this journal.

Hong Kong and Hasselt, February 2026.

Guest Editors

Quan Li and Paulius Pobedinskas