

This is the peer reviewed version of the following article:

Characterization and TCAD modelling of diamond Schottky barrier diodes as test structures for the development of a high-power electronics technology / Bassaler, Julien; Biasin, Giacomo; Buffolo, Matteo; Chini, Alessandro; De Santi, Carlo; Manuelfregolent, ; Letellier, Juliette; Maurya, Vishwajeet; Meneghini, Matteo; Verzellesi, Giovanni. - (2025). (35th International Conference on Diamond and Carbon Materials (ICDCM 2025) Glasgow (UK) 31/8/25-4/9/25).

Terms of use:

The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

29/04/2026 21:07

(Article begins on next page)

Characterization and TCAD modelling of diamond Schottky barrier diodes as test structures for the development of a high-power electronics technology

DIAMFAB: Julien Bassaler, Vishwajeet Maurya, Juliette Letellier

IUNET-UNIPD: Matteo Meneghini, Manuel Fregolent, Matteo Buffolo, Carlo De Santi, Giacomo Biasin

IUNET-UNIMORE: Giovanni Verzellesi, Alessandro Chini

Pseudo-vertical Schottky barrier diodes have been fabricated on Boron-doped diamond layers grown by MPCVD (micro-wave plasma enhanced chemical vapor deposition) on HPHT (high-pressure high-temperature) and CVD substrates. Diodes have different sizes and different metal-to-mesa spacings, to allow perimeter and electric field effects to be analyzed. In this study, results are shown from the extensive characterization of these devices by a coupled experimental/simulation approach, allowing the different operational regimes to be linked to technology-specific parameters for both forward and reverse bias. Effective (N_A-N_D) doping concentration profiles are extracted from quasi-static C-V measurements. Charge trapping effects are investigated by capacitance DLTS measurements. Reverse breakdown is analyzed both experimentally and by means of simulations. The latter also allow to explore viable optimization routes towards the exploitation of the present technology for the fabrication of high voltage diamond diodes and transistors.

Acknowledgment

This work was funded by the European Union, through the “European Climate, Infrastructure and Environment Executive Agency” (CINEA), within the project “Condition Monitoring and Wide Bandgap Power Electronics - Leading Innovations for the European Energy Sector” (MoWiLife), call: HORIZON-CL5-2024-D3-01, Grant Agreement no. 101172657. Views and opinions expressed are those of the authors only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.