Contribution ID: **429** Type: **Talk**

Innovation Concepts and Applications in Power-Electronics

Tuesday, 18 September 2018 11:00 (15 minutes)

High energy ion beams are used in the power semiconductor industry since 1990s. They are used to prove the correctness of device design for sufficient cosmic ray withstanding capability under real device operation. Proton or helium beams are used to locally modify the excess carrier lifetime in order to widen the safe operation area of fast recovery diodes and switches in demanding application with fast high-power switches like IGBTs and IGCTs (Defect engineering). Proton beams have been also employed for modification of doping profiles by hydrogen donors at the end of wafer production, where high drive temperatures are not allowed anymore. All the cases above are illustrated by some design details of typical industrial products like diode, IGBT and thyristor.
Companies without their own irradiation tools, like in the case of ABB Semiconductors, rely on the expertise and skills of engineers and researchers from large facilities. Some important aspects of this successful co-operation is also part of this contribution. A brief outlook into the future towards the wide bandgap semiconductors is given as well.

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Session Classification: Micro symposium 4

Track Classification: MS4 Innovation and industry