

Preface

The progress in the area of silicon carbide (SiC) power electronics has been driven not only by the intrinsic advantages of this wide-bandgap semiconductor but also by advances in the engineering of interfaces, dielectric layers, and electrical contacts. While SiC offers exceptional properties for high-voltage and high-temperature operation, the performance and reliability of practical devices depend critically on the quality of the SiC/oxide interface, the stability of gate dielectrics, and the formation of low-resistance, thermally robust ohmic contacts. These technological elements form the foundation of high-performance SiC MOSFETs, CMOS circuits, and other advanced devices.

The presented special edition focuses on the latest engineering and technological developments in the interface components of the SiC device. The publication explores gate dielectrics and gate stacks fabricated using techniques such as chemical vapour deposition and atomic layer deposition, with particular emphasis on MOS capacitors as fundamental structures for evaluating dielectric integrity and interface properties. Advanced treatments, including surface conditioning and decoupled plasma nitridation, are presented as effective approaches for reducing interface trap densities and optimising channel mobility in both planar and trench MOSFET architectures.

The formation of reliable electrical contacts is another central theme of this edition. Ohmic, Schottky, and backside metallisation contacts are examined with respect to annealing temperature, contact geometry, and interfacial reactions. Parameters such as contact resistivity, contact front resistance, contact end resistance, and backside contact resistance are discussed as critical indicators of device efficiency and manufacturability.

This edition provides a comprehensive perspective on the technologies that govern charge transport across interfaces and contacts in SiC devices and is intended for researchers, process engineers, and graduate students engaged in the development of next-generation wide-bandgap electronics.

We hope that the contributions presented in this edition will advance future research on interface and contact phenomena, the optimisation of fabrication processes, and the continued improvement of reliable and efficient SiC power devices.