

## Title

Electrical nano-characterization of wide band gap semiconductors (silicon carbide) devices by scanning probe microscopy

## Abstract

Today, the research on wide band gap semiconductors (i.e. SiC) is focused on the reduction of macroscopic defects, that can affect the electronic quality of the material and, hence, the performances of power electronics devices.

Scanning probe microscopy characterizations (e.g., conductive atomic force microscopy (CAFM), and scanning capacitance microscopy (SCM) are powerful techniques providing nanoscale resolution mapping of the electronic properties.

In this work, these techniques, together with conventional devices characterization, have been used to extract the relevant electrical properties (conductivity, spatial charge distribution) of SiC, elucidating also the role played by materials defects.

First, the CAFM and SCM comparison with the surface morphology allowed to identify electrically active defects extending from the bulk to the SiC substrate. Finally, these nanoscale information, compared with I-V analyses on macroscopic SiC diodes of different area fabricated on the same samples and large power SiC MOSFETs, shed light on the density of electrically active defects limiting the performances of microelectronics devices.