Terahertz microprobe-enabled contact-free inspection of large-area graphene

Simon Sawallich, Alexander Michalski and **Michael Nagel**

Protemics GmbH, Otto-Blumenthal-Str. 25, Aachen, Germany

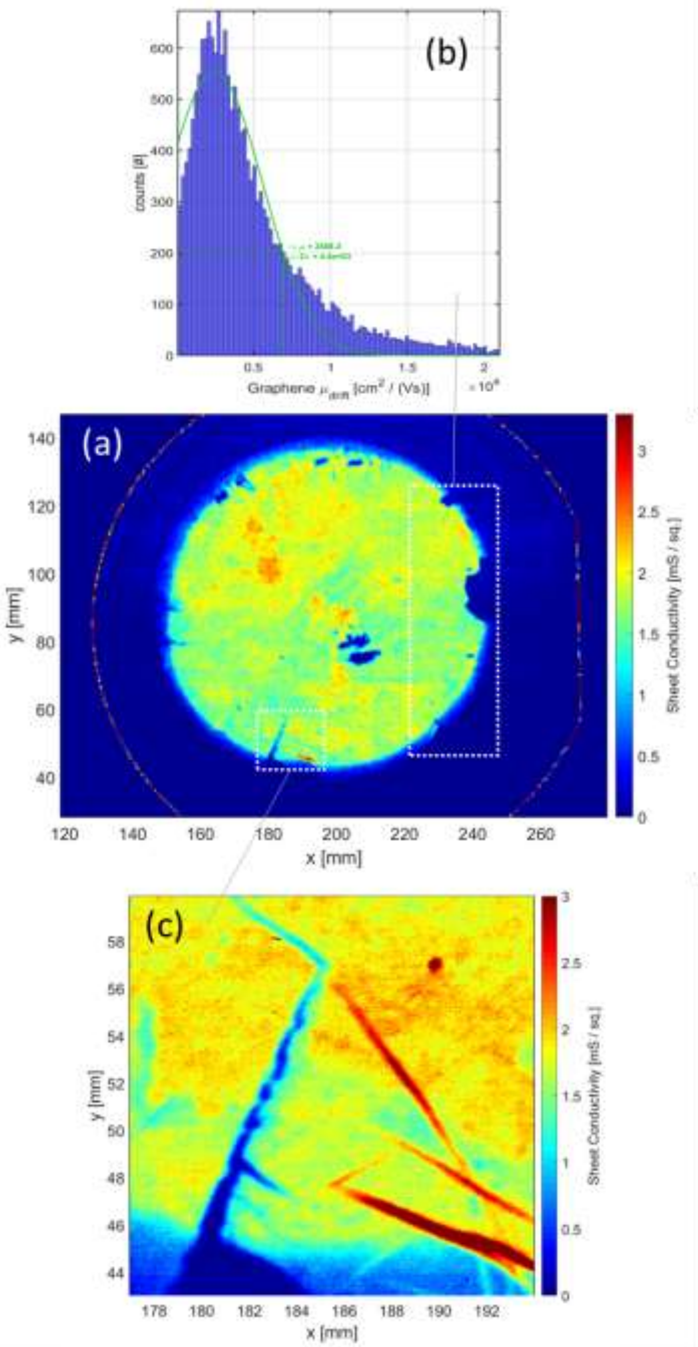
nagel@protemics.com

The currently enforced development of reliable deposition techniques for wafer-scale graphene is extremely important for the establishment of graphene as a new standard material for the semiconductor industry [1]. To foster these developments non-destructive, fast and accurate measurement tools are urgently required to provide feedback information for process optimizations and allow standardized specifications.
Among the currently available methods for contact-free mapping of sheet resistance and carrier mobility values at large area graphene or other 2D materials, Terahertz spectroscopy can be considered as one of the leading methods in terms of measurement speed and accuracy [2].
However, given by the large mm-scale wavelength of THz radiation, the spatial resolution of standard diffraction-limited wafer-scanning systems is too low in many cases. With microprobe near-field detectors [3], allowing THz transmission measurements in close distance to the sample surface it is possible to reach µm-scale spatial resolution without sacrificing measurement speed or accuracy.
In this work, we introduce the microprobe-enabled THz imaging approach and demonstrate its application for the inspection of 4" graphene layers. As an example, we show in Fig. 1 mapping results covering sheet conductivity and carrier mobility, obtained at a commercially available 4" CVD-grown graphene layer transferred onto a silicon wafer.

References

[1] M. Kim et al., 2D Materials, 4 (2017) 035004
[2] P. Bøggild et al., 2D Materials, 4 (2017) 042003
[3] M. Wächter, et al., Appl. Phys. Lett. 95, 041112 (2009)

Figures



resolution mapping of the areas marked in (a).