Improved Method for Probing Resistivity and Doping Concentration of Semiconductors at the Nanoscale Using Scanning Microwave Microscopy (SMM)

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We describe an improved method using a combination of AFM and local microwave measurement (SMM) for a quantitative determination of resistivity and doping concentration of semiconductor materials on a nanometer scale. The microwave reflection signal (S11) is converted into calibrated resistance and capacitance data via a three error parameters workflow which does not require a calibration step on a known dopant standard sample [1]. By means of an analytical model for the junction of AFM tip and semiconductor the resistance can be converted into resistivity and dopant density data. The method was applied on a silicon sample with p and n doped implant regions and yields a good quantitative agreement with the data-sheet values.

Figure 1: Comparison of measured resistivities to data sheet values for doped silicon.

Références