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Study of surface potential variation in p-/n-type 4H-SiC using scanning kelvin probe microscopy JUNG-JOON AHN, LIN YOU, Semiconductor and Dimensional Metrology Division, National Institute of Standards and Technology, Gaithersburg, MD, LIANGCHUN YU, GE Global Research, Niskayuna, NY, SANG-MO KOO, Kwangwoon University, Seoul, Korea, JOSEPH KOPANSKI, Semiconductor and Dimensional Metrology Division, National Institute of Standards and Technology, Gaithersburg, MD — We report surface potential images of p-n junctions in 4H-SiC measured using scanning kelvin probe microscopy (SKPM) and relate them to the local dopant concentration. SKPM has been demonstrated on various semiconductor materials to examine crystalline defects and doping profiles. SKPM measured surface potential depends on the local dopant concentration and clearly differentiates between n-type and p-type materials. As opposed to scanning capacitance microscopy, which requires a good quality surface insulating layer, SKPM requires a clean surface and the lack of a screening oxide might result in higher spatial resolution. For the measurement, partially de-processed SiC high power LMOSFETS were used. The p-n junctions were formed from 4H-SiC wafers having a p-epilayer on p-substrate that was ion-implanted with nitrogen and annealed to build a shallow n-type region. The samples were observed in plan-view and in cross-section. Amplitude modulated, double pass SKPM was implemented with a commercial AFM. We conducted a detailed study of various data acquisition parameters and it seems that the lateral resolution of the potential difference can be enhanced by applying higher ac modulation amplitude and small tip-sample scanning height.

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