

Monitoring Liquid Transport and Chemical Composition in Lab on a Chip Systems using Ion Sensitive FET Devices

Electronic Supplementary Information

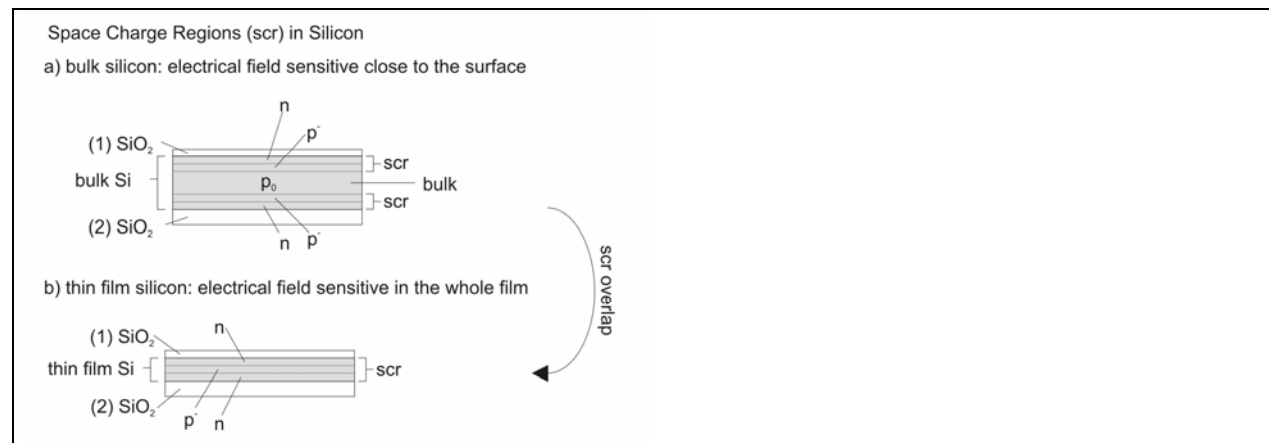


Fig. 1 Space Charge Regions (scr) of p-doped Silicon. a) The charge carrier distribution of bulk silicon. b) The charge carrier distribution of the silicon thin film used in this work. n indicates inversion regions where electrons are the majority charge carriers, p' indicates depletion regions where holes are the majority charge carriers but of a lower concentration than in the bulk and p_0 indicates the bulk region where the concentration of holes is given by the dopant concentration p_0 . In the silicon thin film the scr as the electrical field sensitive region penetrates the whole thin film.

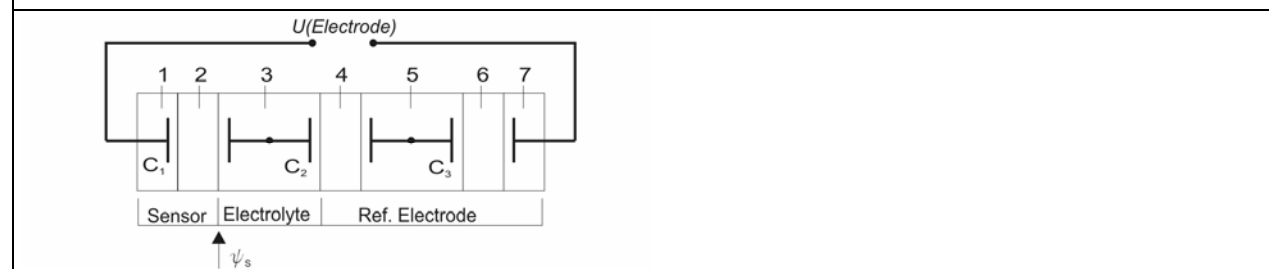


Fig. 2 Capacitances at Material Junctions. The reference electrode potential $U(\text{Electrode})$ is applied between the thin film (1) and the silver wire of the reference electrode (7) to three capacitors in series: C_1 , C_2 , C_3 . C_1 is given by the thin film, the electrolyte and the native oxide as the dielectric. C_2 is given by the electrolyte, the electrolyte inside of the reference electrode and the porous membrane of the reference electrode as the dielectric. C_3 is given by the the electrolyte inside of the reference electrode, the silver wire of the reference electrode and silver chloride salt as the dielectric. At each capacitor a significant voltage drop may occur. The surface potential Ψ_s is measured at the native oxide/ electrolyte interface.

Table 1 materials and equipment

Description	Company
SOI wafer (SIMOX)	Siltronic Japan Corp., Osaka, Japan
ultrasonic cleaner (USC300D)	VWR International GmbH, Darmstadt, Germany
hotplate (810 Digital)	VWR International GmbH, Darmstadt, Germany
PBS buffer tablets (P4417)	Sigma-Aldrich Chemie GmbH, Steinheim, Germany
acetone (for analysis)	ACROS Organics, New Jersey, USA
isopropanol (for analysis)	Merck kGaA, Darmstadt Germany
photoresist (Clariant PL 177)	Microchemicals, Ulm, Germany
developer (AZ developer)	Microchemicals, Ulm, Germany
adhesion promotor (TI Prime)	Microchemicals, Ulm, Germany
exposure unit (Aktina E)	Walter Lemmen Apparatebau, Kreuzwertheim, Germany
hydrofluoric acid (for analysis)	Merck kGaA, Darmstadt Germany
nitric acid (for analysis)	Merck kGaA, Darmstadt Germany
PDMS (Silgard 184 Kit)	Dow Corning, Midland, USA
silver glue (Epo-Tek EE129-4)	Polytec GmbH, Waldbronn, Germany
epoxy resin (UHU plus sofortfest)	UHU GmbH, Bühl, Germany
tungsten probes (PH-100)	Süss Microtec AG, Dresden, Germany
ref. electrodes (MI-402)	Microelectrodes Inc., Bedford, USA
voltage source (E3647A)	Agilent, Palo Alto, USA
voltage source with integrated amperemeter (Model 2400)	Keithley Instruments Inc., Cleveland, USA
picoamperemeter (Model 6485)	Keithley Instruments Inc., Cleveland, USA
measurement program (Labview)	National Instruments Corp., Austin, USA