

DRY-OXIDATION RATE OF SI (100) SURFACE UP TO 2 NM-OXIDES THICKNESS

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ABSTRACT

The oxidation rate of a Si(100) surface at oxide thicknesses up to ~2 nm has been measured using chemical-state-resolved x-ray photoelectron spectroscopy in a wide range of oxidation temperature (300 - 850 °C) and oxygen pressure (10⁻⁶ - 1 Torr). The rate curves show very rapid oxidation at the initial stage under all oxidation conditions. The thickness of this initial rapid oxidation depends on the oxidation temperature as well as the oxygen pressure. The data in this regime are not explained by the standard oxidation model and give very important information on the formation of silicon gate oxides in highly integrated metal-oxide-semiconductor field-effect-transistor devices.

KEYWORDS: Chemical Shift, Core-Level Photoelectron Spectroscopy, Dry Oxidation, Gate Insulator, MOS FET, Oxidation Rate, Silicon Oxide, Ultrathin Oxide Layer