STUDY OF THE STRUCTURE OF ULTRATHIN SILICON DIOXIDE FILMS

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S u m m a r y

The structural properties of ultrahin (2—10 nm) and thin (10—40 nm) SiO_2 films grown thermally on silicon at $T = 800$—950 °C in oxygen atmosphere were investigated in detail with the help of three independent analytical methods, namely, IR spectroscopy, ellipsometry, and step-by-step chemical etching. We discovered a wide transition layer of SiO_2 adjacent to silicon. The transition layer between silicon and bulk SiO_2 is heterogeneous and consists of three layers. There exists a transition SiO_x layer between Si and SiO_2 approximately 1.5 nm in thickness. A SiO_2 film is also heterogeneous and consists of two layers. The first one has a thickness d of 2—3 nm, and $d > 8$ nm for the other one. Between these two layers, there exists a transition layer 3—5 nm in thickness.