

75 Word Abstract

Statistical Analysis of Soft Breakdown in Ultrathin Gate Oxides

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It is found that the Weibull slope β of the time-to-soft breakdown (t_{SBD}) distributions coincides with that of time-to-hard breakdown (t_{BD}) distributions over the oxide thickness range $T_{\text{OX}} = 1.9\text{--}4.8$ nm. The decrease in β of both t_{SBD} and t_{BD} distributions as T_{OX} decreases is well correlated to measured Si–O–Si bond angle reduction induced by compressive stress in SiO₂ network. These results suggest that soft breakdown (SBD) as well as hard breakdown (HBD) are triggered by a common physical mechanism such as defect generation from strained Si–O–Si bonds .