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Radiation-Induced Interface Traps in Silicon Bipolar Transistors¹ HAROLD P. HJALMARSON, Sandia National Laboratories, CHARLES E. HEM-BREE, Sandia National Laboratories, RONALD L. PEASE, RLP Research — Experiments on bipolar transistors have shown that gain degradation increases as the dose rate is reduced for a given total dose of ionizing radiation. We suggest that this effect is caused by competing reactions involving hydrogen released from oxide sites by the ionizing radiation. At low dose rates, most of the hydrogen reacts with hydrogen-passivated Si dangling bonds at the semiconductor-oxide interface to create interface traps (Pb-centers), but at higher dose rates a larger fraction of the hydrogen is consumed in other reactions that depend on the dose-rate. This presentation will discuss continuum calculations of the the interface trap density as a function of radiation dose rate. These calculations will be compared with experimental data for dose-rate dependent irradiation of test structures.

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