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Recombination rate annealing following transient neutron irradiation[1] HAROLD HJALMARSON, PETER SCHULTZ, NORMAND MODINE, Sandia National Laboratories — Neutron irradiation of bipolar transistors generates defects by displacing silicon atoms. For each displacement collision, a pair of defects is created, the interstitial atom and the vacancy left behind. These defects reduce transistor gain by increasing the recombination rate of electrons and holes thereby increasing the base current of these devices. After the radiation ceases, these defects undergo reactions that produce composite defects that are less effective at carrier recombination. In this presentation, we discuss simulations of the temporal evolution of these defects and the carrier recombination rate. We find that the initial carrier recombination rate is dominated by recombination at interstitials in p-type silicon and vacancies in n-type silicon. For p-type silicon, the short-time annealing is controlled by athermal diffusion of interstitials, and this diffusion rate, which is governed by carrier recombination at the interstitial, can be controlled by injection of minority carrier electrons. Our results will be compared with experimental data.

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