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Effects of high optical injection levels in polycrystalline Si wafers on carrier transport DONEISHA STEELE, ANDREY SEMICHAEVSKY, Lincoln Univ - PA — High levels of carrier injection in polycrystalline Si may arise, for example, in solar cells under concentrated sunlight. Mechanisms for non-radiative carrier recombination include trap-mediated SRH and higher-order processes, e.g., Auger recombination [1]. In this paper we present our experimental results for intensity-dependent carrier lifetimes and conduction currents in polycrystalline Si wafers illuminated with pulses of up to 50 Sun intensity. We also use a computational model for carrier transport that includes both SRH and Auger recombination mechanisms, in order to explain our experiments. The model allows quantifying recombination rate dependence on carrier concentration. Our goal is to relate the recombination rates to Si microstructure and defect densities [2] that are revealed by IR PL images. We acknowledge the NSF support through grant 1505377. [1] A. Richter, S.W. Glunz, F. Werner, J. Schmidt, and A. Cuevas, Improved quantitative description of Auger recombination in crystalline silicon, Phys. Rev. B 86, 165202 (2012). [2] H. C. Sio, T. Trupke, D. Macdonald, Quantifying carrier recombination at grain boundaries in multicrystalline silicon wafers through photoluminescence imaging. J. Appl. Phys. 116, 244905 (2014).

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