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Electron Motion near Defects in Solar Cells AIDAN EDMONDSON, TIM GFROERER, Davidson College, FAN ZHANG, YONG ZHANG, University of North Carolina at Charlotte — Most solar cells are made of crystalline materials that contain a variety of defects, which form during crystal growth. These defects reduce the efficiency of the device because defective regions allow energy to be lost as heat. Normally, the electron-hole pairs that are created when sunlight hits the solar cell generate current. But these pairs can be drawn into defects where they produce heat instead. We study the effects of defects in GaAsP semiconductors with and without doped conductive layers. By stimulating the samples with unfocused laser light, we can analyze the influence of defects as a function of illumination and temperature. We also use laser mapping to investigate the behavior under focused illumination. Our work shows two effects. First, electrons move differently in the presence of conductive layers, indicating that a different diffusion model is required for solar cell devices. Second, defect-related losses operate differently when we switch between the unfocused and focused illumination experiments.

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