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Contact-free approach for the determination of minority carrier diffusion length[1] F.M. BRADLEY, WILL FREEMAN, NANCY M. HAEGEL, Naval Postgraduate School — Direct imaging of electron/hole recombination via an optical microscope and a high sensitivity charge coupled device coupled to a scanning electron microscope captures spatial information about the transport behavior in luminescent solid state materials. Carriers are generated by the electron beam, and an image of the recombination provides highly localized information on carrier diffusion and/or drift. Unlike conventional cathodoluminesence, the e-beam is not scanned. Recent work has demonstrated the feasibility and limitations of the technique. Comparisons will be made of luminescent images in 3D (bulk) and 2D (quantum well) limits. In the 3D case, the excitation volume plays a key role, while in 2D, beam size and carrier diffusion determine the luminescent spot size. The technique provides the potential for extraction of minority carrier diffusion length without the use of contacts. It allows for easy localization of the measurement site, broad application to a range of materials and potential industrial automation. This technique is of special interest for devices such as solar cells, where minority carrier lifetime is a key performance parameter.

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