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(54) Title: SEPARATION OF DOPING DENSITY AND MINORITY CARRIER LIFETIME IN PHOTOLUMINESCENCE MEASUREMENTS ON SEMICONDUCTOR MATERIALS

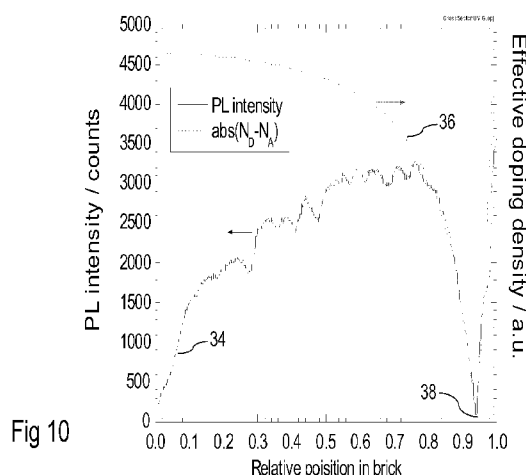


Fig 10

(57) Abstract: Methods are presented for separating the effects of background doping density and effective minority carrier lifetime on photoluminescence (PL) generated from semiconductor materials. In one embodiment the background doping density is measured by another technique, enabling PL measurements to be analysed in terms of effective minority carrier lifetime. In another embodiment the effective lifetime is measured by another technique, enabling PL measurements to be analysed in terms of background doping density. In yet another embodiment, the effect of background doping density is removed by calculating intensity ratios of two PL measurements obtained in different spectral regions, or generated by different excitation wavelengths. The methods are particularly useful for bulk samples such as bricks or ingots of silicon, where information can be obtained over a much wider range of bulk lifetime values than is possible with thin, surface-limited samples such as silicon wafers. The methods may find application in solar cell manufacturing for improving the manufacture of silicon ingots and bricks, or for providing a cutting guide for wafering.