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Using Deep Level Transient Spectroscopy (DLTS) to characterize defects in semiconductor devices

DAVID LANG, Materials Physics Consultant

Deep Level Transient Spectroscopy (DLTS) is a member of the class of instrumentation methods that utilizes the detection of trapped electronic charge to characterize defects in solids. Such methods detect this charge either directly, e.g. via capacitance measurements, or indirectly, e.g. via the current associated with the release of trapped charge. These types of instrumentation have been widely used since the dawn of solid-state physics, particularly for nonradiative defects in semiconductors and insulators. In the case of semiconductor devices, the highly sensitive capacitive detection of trapped charge in the junction depletion layer makes these methods particularly powerful. The DLTS method introduced the concept of time-domain filtering (the so-called "rate window") to create a defect spectrum from the transient response of the device versus temperature. This talk will give an overview of DLTS, with particular emphasis on the correlation between defects and device performance.