**Microwave Detected – Photo Induced Current Transient Technology (MD-PICTS)**

MD - PICTS is a contact less, non destructive measurement technology for the electrical characterization of defect levels in a large variety of semiconductors. Owing to the high sensitivity, at sufficiently low injection levels thermal excitation of charge carriers out of defect levels filled during a photo pulse can be observed, see Fig. 1. After the light is turned off, the photoconductivity transient signal consists mainly of two parts. The first part, a fast decay, corresponds to the minority carrier lifetime. This is followed by a much slower decay process due to the thermal emission of carriers out of defect levels. Important are sufficiently long photo pulses in order to fill the defect levels.

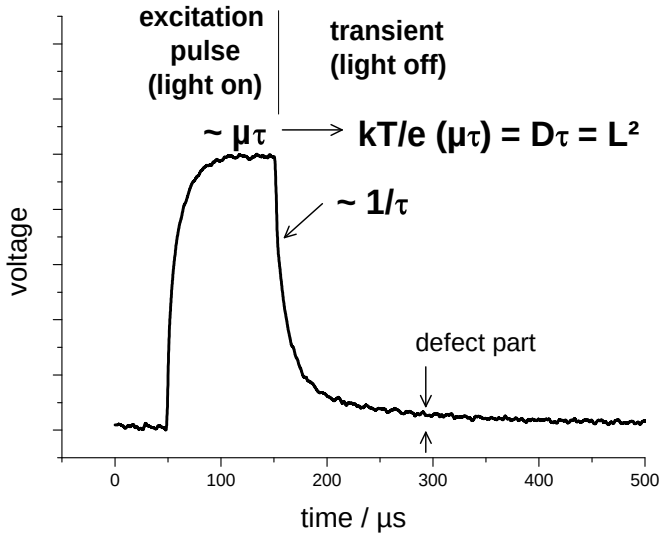


**Fig. 1:** Typical photoconductivity signal for a rectangular light pulse, p silicon wafer

Temperature dependent measurements of such signals lead to defect specific photo conductivity transients which can be used in a similar way as DLTS capacitance transients to obtain specific information about the defects under investigation. This opens the possibility to obtain defect spectra as with DLTS measurements, however, contact-less, non-destructive, highly spatially resolved and without any sample preparation. Moreover, doping is not a critical parameter and the investigations are not restricted to just deep levels. In contrast to DLTS, with MD-PICTS defects are filled by carriers via the valence or conduction band, or both. Therefore, MD-PICTS spectra on the one hand give access to a variety of defects so far not detectable by other electrical characterisation methods. On the other hand, some defects seen by DLTS are invisible by MD-PICTS. Depending on the concentration of the defects, the sensitivity of the detection system must be extremely high in order to see the defect specific slow part of the transient signal at all. At the same time, the light intensity must be kept

sometimes even extremely low in order to prevent the photoconductivity transient from being completely dominated by just the otherwise big part due to the free carrier lifetime.

Just one example for high quality p type silicon wafers is shown in Fig. 2. The spectra show two well pronounced defect levels. DLTS spectra at the same sample show just a flat line.

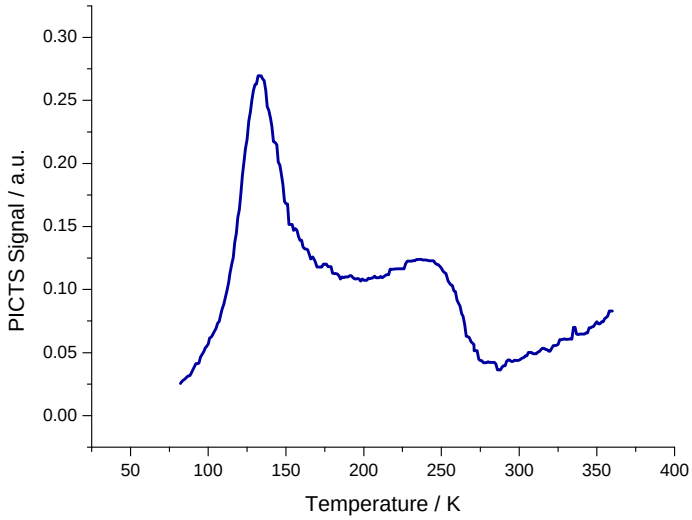


**Fig. 2:** MD-PICTS spectra of electronic grade p doped silicon

For more details and examples see publications.