**Abstract**

The aim is to investigate the change in the surface of semiconductor materials and diode structures in an aqueous environment under illumination and current flow using spectroscopic ellipsometry. For this purpose, study was then carried out on simple semiconductor surfaces (classical III-V, InP …) and subsequently on heterostructures (diodes) depending on the illuminance and the chemical environment. Questions that should be clarified are: Is there only a roughening of the surface or a chemical change? What are the photo-chemical process influence the ellipsometric measurement data and how can these effects be modeled? In addition to spectroscopic ellipsometry, methods for real structure investigation and chemical surface investigation are to be used comparatively