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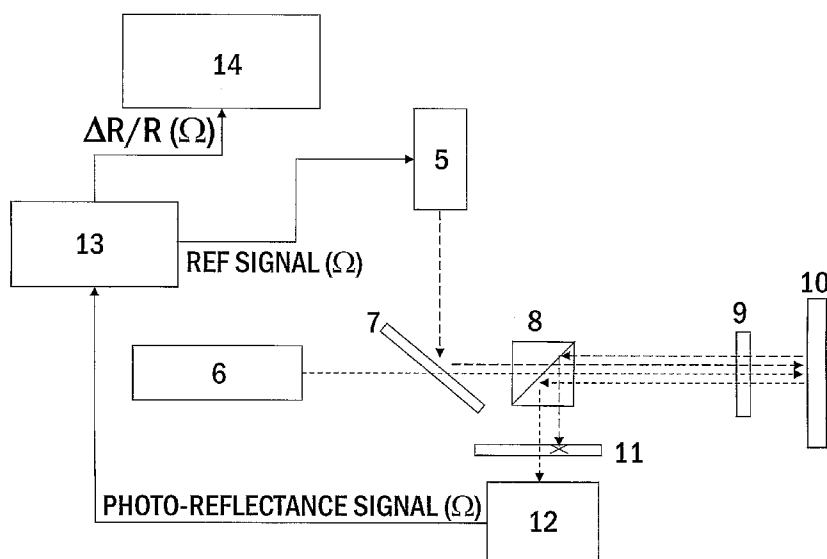
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(54) Title: METHOD OF PHOTO-REFLECTANCE CHARACTERIZATION OF STRAIN AND ACTIVE DOPANT IN SEMICONDUCTOR STRUCTURES



(57) Abstract: A new method of photo-reflectance characterization of strain and active dopant in semiconductor structures has been developed for characterization of physical properties of semiconductor structures. The underlying principle of the strain and active dopant characterization technique is to measure photo-reflectance signals occurring nearby to interband transitions in the semiconductor bandstructure and which are highly sensitive to strain and/or active dopant through the effect of the nanometer scale space charge fields induced at the semiconductor surface. To attain this, the present disclosure comprises an intensity modulated pump laser beam and a continuous

wave probe laser beam, focused coincident on a semiconductor structure. The pump laser provides approximately 15 mW optical power in the NIR-VIS. The pump light is amplitude modulated by a signal generator operating in the range of 100kHz-50MHz. The probe beam is approximately 5 mW operating in the VIS-UV and is generally of wavelength nearby to strong optical absorptions in the semiconductor structure. The pump and probe are focused co-incident to a micrometer scale spot on the sample. Probe specular reflections are collected and the pump wavelength light is removed using a color filter. The remaining probe light is directed onto a photodiode and converted to an electrical signal. The probe AC signal then contains pump induced changes in the semiconductor material optical response. Phase sensitive measurement is performed on the photodiode output and the AC signal is divided by the DC reflectance signal. Thus photo-reflectance information is recorded as a function of probe wavelength, modulation frequency, pump intensity, and pump and probe polarizations.