Project reference : PTDC/FIS/121383/2010
Project title: Luminescence Analysis of Radiation Effects - LARE

Luminescence and related signals in LARE

Matrix of compatible irradiation and detection regimes

		Primary Irradiation				Secondary Irradiation	
	Prefix For Signal	**Photo-**	**Cathodo-**	**Radio-**	**Iono-**	**Thermally Stimulated-**	**Photon/Optically Stimulated-**
Irradiation	**Type**	Photon beam/radiation	Low energy accelerated electron	Ionising radiation: X; γ; β/high energy accelerated electron; α	Ion beam: accelerated ion ranging in mass from proton to heavy charged particle	Thermodynamic eviction of charge from traps filled during primary irradiation	Electromagnetic eviction of charge from traps filled during primary irradiation
	Energy	Theory: any including ionising. Practice: generally MidIR-UV: 10^{-2}-10^{2} eV	10^{0}-10^{3} eV	10^{3}-10^{7} eV	10^{3}-10^{7} eV	Limits defined by coolant (LN_2) and incandescence (77-1000 K): 10^{-3}-10^{-1} eV	Theory: any including ionising. Practice: generally NIR-UV: 10^{-1}-10^{2} eV

Detection

Signal	Precursor Process	Emission Process	Type	Timescale
Raman Scattering	Transfer of energy from photons to molecular electronic energy states	Vibrational relaxation	Photon	10^{-12} s
Fluor-escence	Excitation of electrons in atoms/molecules by resonance	De-exitation	Photon	10^{-9} s
Phosphor-escence	Exitation of electrons in, or ionisation of, atoms/molecules	Delayed de-exitation (quantum state change) and/or trapping and recombination	Photon	10^{-3}+ s
Conductivity	Ionisation of atoms/molecules or eviction of charge from traps	Presence of charge in conduction band	Reduced electrical resistance	10^{-3}-10^{2} s during Phosphor-esence
Exo-electron emission	Thermal or electromagnetic stimulation of near-surface electrons, already in the conduction band or directly from traps	Energy exceeds work function of the material or a local defect structure	Electron (current)	10^{-9}-10^{2} s

Measurement	1	2	3	4	5	6
A	During Irradiation, mainly Stokes	-	-	-	-	During Irradiation
B	During Irradiation (& after ps pulse), mainly Stokes	During Irradiation	During Irradiation	During Irradiation	During Irradiation	During Irradiation (& after ps pulse), use Anti-Stokes
C	During / After Irradiation, mainly Stokes	During / After Irradiation	During / After Irradiation	During / After Irradiation	During / After Irradiation	During / After Irradiation use Anti-Stokes
D	Little unless photoelectric threshold acheived	During / After Irradiation	During / After Irradiation	During / After Irradiation	During / After Irradiation	During / After Irradiation
E	Little unless photoelectric threshold acheived	-	During / After Irradiation	During / After Irradiation	During / After Irradiation	During / After Irradiation