

Current subject area(a):

Physics

Status	Course code / number in the book: TF 1101. "Migration and transformation of electron excitations in condensed matter". Taught by: Anatoliy Voloshinovskii			
Acad. cycle	ECTS credits	Duration	Semester	Contact hours
Specialist	8	1 semester	Autumn	108(36)
Year of study	Weekly lectures/seminars		Prerequisites	
5 st - - - -	1 / 2		Common course of physics	
Languages	Examination		Assessment	
English	Written exam		100-point scale	

Objectives: to familize students with peculiarities of excitation energy transformation in condensed matter.

Intended capabilities: to have essential basics of the knowledge about luminescence excitation mechanisms in materials in different aggregate states, to be able to investigate the spectral parameters and kinetics of luminescence to determine the nature of elementary oscillator and physics parameters of atoms, molecules and ions; to understand the features of the luminescent systems development (scintillators, phosphors, dosimeters, etc.), and the fluorescent analysis

Description.

Definition and classification of luminescence, main characteristics of luminescent materials. Field of oscillators radiation, polarization of radiation. The quantum states of atoms and energy terms, resonance luminescence and fluorescence. Radiative processes in gases. The polarization of resonant luminescence. Frank-Condon principle. Features of molecular luminescence. Energy band model of crystals. Time characteristics of recombination luminescence. Luminescence decay kinetics. Traps and methods for their parameters determining. Thermoluminescence and color centers. The dosimetric sensors based on TSL. Electron-phonon interaction. Energy schemes of crystals doped with lanthanide ions. Features of transition metal ions luminescence. Sensitized luminescence. Upconversion. Free excitons. Self-trapping of electronic excitations. The main types of radiation defects in solids.

Reading List:

1. G. Blasse, B.C. Grabmaier. Luminescent materials. Springer-verlag, 1994.
2. R. Ronda. Luminescence. WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim 2008.
3. Sh. Shionoya, W.M. Yen, H. Yamamoto. Handbook of phosphors. CRC Press 2006.
4. P.A. Rodnyi. Physical Processes in Inorganic Scintillators. CRC Press 1997.