

NANOSCIENCE AND NANOTECHNOLOGY PROGRAM

Iouri Koudriavtsev, PhD



Research Interests:

- Secondary Ion Mass Spectrometry, AFM, Raman Spectroscopy, EDX-WDX, XPS.
- Surface patterning by ion beam,
- Ion implantation
- Nano-structured semiconductors
- OHD (archaeometry)
- Application of SIMS in biology and medicine

Dr. I. Koudriavtsev is Professor in the Electrical Engineering Department, Solid State Electronics Section. He completed his MSc and PhD at the State Technical University of Saint Petersburg, Russia. He worked in Ioffe Physical -Technical Institute (S-Petersburg, Russia) from 1996 to 1999, then performed postdoctoral study in Cinvestav-IPN (1999-2000). And he made a short research study at Harvard Medical School (2000-2001), devoted to SIMS application in cell biology. In 2001, he accepted an offer for a PI position at Cinvestav.

Dr. Koudriavtsev is a specialist in Surface Analysis by different analytical techniques: SIMS, and other techniques. During 2013 -2019 years Dr. Koudriavtsev realized a complex study in Archaeometry by SIMS (Obsidian Hydration Dating). He realized as well four Conacyt projects devoted to: - solar cells (two projects), - ohmic contact for III-V semiconductors, and - analytical instrument development.

He is author and co-author of more than 130 publications that received more that 1000 citations. *h* - index 16

Dr. Koudriavtsev is member of SNI, Nivel II.

He directed three PhD thesis and three MSc thesis.

Research Project: formation of nano-structured materials by ion beam irradiation.

We perform experimental and theoretical investigation of low-energy ion interaction with solid surface. The principal object of the study is a nano-patterning of surfaces by ion beam with formation of strongly regular structures like surface nano-dots, nano pyramids, waves etc., which can be used in opto-electronics (lasers and LEDs, solar cells). We are going to develop physical model for low energy ion patterning of varied materials in the so-called thermal spike regime (TS) of ion irradiation. A special interest is a biological “response” of nano- (micro-) structured surfaces of semiconductors, metals, glasses and polymers. We use SERS and PERS to study bioactivity of nanostructured surfaces.

Low energy ion implantation is another subject of our study. The ion implantation realized in the TS regime can be used for a partial or complete crystallization of a near surface layer (the Ion Beam Induced Crystallization process). This effect can be used to fabricate nanocrystals embedded in amorphous or polycrystalline matrix with unique optical characteristics. The main forces will be directed to prepare nanostructured Si, which can emit light. Porous semiconductors formation under low energy ion irradiation is another subject of our study.

We are going to prepare and to study nano-structured Bi containing semiconductors. Bi⁺ ion irradiation of different III-V and II-VI semiconductor in the TS regime are used to prepare such semiconductors. Optical and electrical characteristics of the Bi-contained ternaries will be studied.

We develop new sample preparation techniques and analytical protocols for SIMS imaging of elements and stable isotopes in biological cells and tissue.