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As is widely known, the creation of emitters based on silicon (in the crystalline or amorphous state) doped with erbium ions has attracted the attention of many research groups throughout the world. The attention is attributable to the possibility of producing efficient emitters that operate at a wavelength of 1.5 μm, where fibers transmitting optical signals exhibit their peak transparency, as well as the fact that such an emitting element can be smoothly integrated into silicon optoelectronic devices.

The creation of such a laser is clearly the ''dream'' of integrated optics. The realization of this dream depends on a deep understanding of the physical processes involved in exciting electronic levels of the erbium ion that are located in the valence band of the semiconductor and on knowledge of the details of the energy level diagram of erbium, which often forms large centers with its local environment in the matrix. Unfortunately, for a number of reasons, the electron paramagnetic resonance signal of Si–Er systems is poorly displayed or not observed at all. Therefore, the most effective experimental method is measurement of the luminescence excited by a current in a $p-n$ junction or photoluminescence.

Representatives of groups from Italy, the Netherlands, and Russia (Moscow and St. Petersburg), who are involved in the technology of fabricating Si–Er devices and are developing physical methods for investigating these objects, have gathered in the A. F. Ioffe Physicotechnical Institute and the St. Petersburg State Technical University to participate in this seminar.

The research teams in the Physicotechnical Institute (which is closer to me) have obtained the following noteworthy results.

— A new mechanism for exciting erbium ions in a reverse-biased $p-n$ junction as a result of the recombination of electrons from the upper conduction subband with valence-band holes has been discovered.
— The mechanism of electroluminescence in amorphous silicon has been thoroughly studied.
— Electroluminescent structures based on crystalline silicon, which exhibit diverse luminescence characteristics, have been obtained on substrates with various crystallographic orientations.

I wish this small seminar success and our guests pleasant impressions of St. Petersburg.

Translated by P. Shelnitz

