

## The maser effect in molecular crystals

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The invention of maser by N. Basov and A. Prokhorov marked the beginning of a laser era. The principle of stimulated emission was brilliantly implemented in microwave radiation in molecular beams. Nowadays, solid state media are used to obtain visible and NIR laser radiation. At the same time, obtaining coherent microwave radiation has been neglected. In recent years, rapid development of molecular crystal growth technology has enabled to describe new mechanisms of maser origin for generating coherent microwave radiation in solid state. In my lecture I'm going to give the historical overview of the development of ideas in microwave and later THz radiation in solid state. I'll speak about the unique properties of molecular crystals as if specially created for the development of coherent THz radiation. The special role in such crystals is played by time resolved behavior of phonons and polaritons. In some cases they are capable of emitting electromagnetic radiation, and in some cases even enhance it. I'll also discuss the main mechanisms for narrow- and broadband coherent THz radiation. Sometimes such processes require phase-matching conditions. In the concluding part of the lecture I'll talk about the application of molecular crystals for the creation of broadband metamaterial-based chemical sensors.



### **Short Bio:**

**Alexander Shkurinov** Alexander Shkurinov in 1985 graduated with honours from the M.V. Lomonosov Moscow State University (MSU), Moscow, Russia. He received his Ph.D. degree in Physics from MSU in 1988. Since 2004 he is a full-time Professor at the Department of Physics of the MSU where he is Head of the

Laboratory of terahertz optoelectronics. The research interests of Alexander Shkurinov are mainly centered around the development and application of femtosecond laser techniques, time-resolved spectroscopy of molecules in

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liquid phase, nonlinear optics and THz techniques and spectroscopy. The results obtained by Alexander Shkurinov have been published in more than 350 scientific papers in peer-reviewed journals.