

Artificial materials for nonlinear optics

Abstract:

Nonlinear optical materials play a key role in the development of coherent sources of radiation as they permit the frequency conversion of mature solid-state lasers into spectral ranges where lasers do not exist or perform poorly. In particular, mid-infrared transparent nonlinear materials are required for a number of optronics applications. Gallium arsenide has a high nonlinear coefficient, a high thermal conductivity, and is transparent throughout the mid-infrared. Efficient quasi-phase-matched nonlinear interactions can be achieved by growing thick layers of GaAs on periodically oriented GaAs template substrates. Recent progress in processing thick orientation-patterned gallium arsenide crystals allows their excellent nonlinear properties to be employed in practical mid infrared devices. This presentation will address both crystal growth aspects and recent devices demonstrations.

Dr. Eric Lallier has been involved in research on lasers and nonlinear optics for over 20 years. After a one year stay at the Lawrence Berkeley Laboratory (Berkeley, Ca), he joined Thales Research & Technology as a PhD student in 1987. He became a staff member in 1990 and was head of the Photonic Technology Component laboratory from 1996 through 1999. He was head of the Laser Source and Nonlinear Optics laboratory from 2000 to 2010, and he is now leading the Optronics Sources activity within the Physics Research Group. His Current research topics include bulk and fiber solid-state lasers for direct eye-safe emission, frequency conversion to the mid-IR using engineered quasi-phase-matched materials such as orientation patterned GaAs, and beam combination of fiber or semiconductor lasers. He has previously been involved in several EC funded projects and currently participates to MIRSURG, a FP7-ICT project targeting ophthalmic surgery with 6.45 μm lasers. He authored or co-authored more than 50 publications in journals and conferences, and hold several patents. He was awarded the Fabry de Gramont prize from the French Optical Society in 1993.