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Optical parametric sources for the infrared/Sources optiques paramétriques pour l'infrarouge

Foreword

More than 40 years after the first realisation of a parametric oscillator in the optical part of the electromagnetic spectrum, optical parametric oscillators (OPOs) have become prime sources presenting specific advantages, particularly in the mid-infrared range, such as large and continuous tunability, high peak power, beam quality, ...

In his review, *A. Godard* compares the performance of different mid-infrared sources: gas, solid state, rare earth, semiconductor lasers and OPOs. This article relates these different technologies to specific applications. One of these, discussed by *W. Chen et al.* is gas sensing, where high tunability and high spectral purity in the mid-infrared are of utmost importance and well addressed by non linear optical solutions. These sources will play a major role in the quickly evolving market of environment monitoring and control. Another application requiring high power and high beam quality is counter-measurements, for airplane protection against the highly disseminating menace of portable missiles. *M. Schellhorn et al.* describes the state-of-the-art concerning dedicated OPOs in the 2 to 5 μm for such applications.

Although OPOs have been proposed long ago, new and original architectures still improve the performance of these devices in a spectacular way. As an example, *A. Berrou et al.* show how optical conversion and spectral linewidth can be optimised in highly compact systems. Among the most original innovations during the last ten years, semiconductors of the mainstream such as GaAs, ZnSe, ... are the subject of intense research (see also the review of D.S. Hum and M. Fejer, [1]). These studies are motivated by the outstanding intrinsic qualities of the materials considered: high non linear coefficients, high transparency on large spectral range, technological perspectives. Thanks to the fantastic material sciences that have been developed with these semiconductors (growth, processing, ...), many different phase matching schemes are proposed. *J.M. Jancu et al.* show that intrinsic birefringence can be obtained in ultra-short period superlattices, *M. Ravaro et al.* observe parametric fluorescence and counterpropagating twin photons in structured waveguides. *C. Diederichs et al.* make use of coupled microcavities for the same purposes. *M. Raybaut et al.* develop a phase matching scheme based on total internal reflection which exhibits a spectacular tunability range.

These papers reflect the intense activities of this field, which was the subject of a Conference held on the 5 and 6 February 2007 at the EDF Research Center in Clamart. These *Journées Scientifiques de l'ONERA* were entitled "*Parametric light sources for the infrared*" and were organised by ONERA under the auspices of the *Académie des sciences*.

References

[1] D.S. Hum, M. Fejer, C. R. Physique 8 (2) (2007) 180–198.

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