

METAMATERIÁLY - METAMATERIALS

Photonic crystals represent a new class of materials which interact with photons in a manner analogous that in which electrons interact with periodic potentials in a crystal lattice [1]. The photonic band gap (PBG) structures that have been investigated and experimentally realized over the past decade demonstrate that the idea of tailoring the properties of light in such structures was a fruitful one, and it is expected to belong to key nanotechnologies which will play crucial roles in storing, and transporting information in light speed computers and advanced telecommunications systems. The true potential in using these materials, however, originates from the fact that in photonic crystals functionality is as much as a property of material parameters – concept referred to as *metamaterials* [2].

By employing this concept one can design structures that possess new and unusual properties not attainable in naturally occurring materials. One example of such a substance, termed a left-handed material (LHM), was predicted by Veselago [3]. In a theoretical analysis of the physical properties of such hypothetical medium Veselago he showed that in such a substance \mathbf{E} , \mathbf{H} and \mathbf{k} (where \mathbf{E} and \mathbf{H} stand for vector of the electric and magnetic field, respectively while \mathbf{k} denotes a wave vector) form a left-handed set of vectors, which gives rise to rather unusual phenomena such as reversed Doppler effect, reversed Cerenkov radiation, and inverse Snell's law, for example. In particular it has been suggested that negative refraction leads to a superlensing effect that can potentially overcome diffraction limit inherent in conventional lenses [4].

Výše uvedeným úvodem do problematiky fotonických krystalů, resp. tzv. metamateriálů jsme chtěli upoutat pozornost případných zájemců o tento fascinující a dynamicky se rozvíjející obor, který patří mezi nejnadějnější oblasti nově se formujících nanotechnologií a jehož aplikační potenciál již přináší hmatatelné výsledky. Zároveň bychom tímto chtěli vyzvat zájemce o tento obor, kteří by tuto problematiku zvažovali jako vhodné téma pro jejich řešeršní práci, aby kontaktovali

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[1] see article by Eli Yablonovitch - pdf file available on <http://www.ure.cas.cz/~kuzmiak>

[2] <http://www.pbglink.com/groups.html>, <http://ab-initio.mit.edu/photons/tutorial/>

[3] V. G. Veselago, Sov. Phys. Usp. 10, 509 (1968).

[4] J. B. Pendry, Phys. Rev. Lett. 85, 39566 (2000).