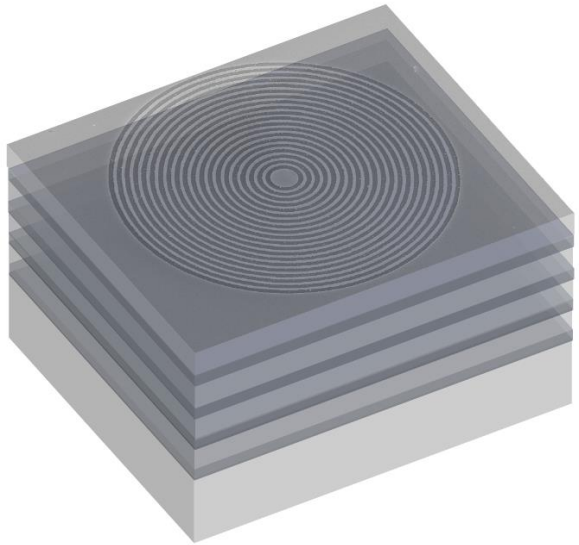
Photonic nanostructure for the amplification and targeting of light radiation

Abstract

The proposed invention consists of a photonic structure, made of transparent dielectric materials, adapted to control the emission of radiation - such as fluorescence - by emitters that are located on its surface. These characteristics result into an increased efficiency in addition to an enhanced targeting of the light emitted, which is conveyed towards preferred directions rather than being distributed isotropically.

Priority Number: TO2014A000215

Politecnico di Torino



- amplified fluorescence
- surface waves
- photonic crystals
- dielectric diffractive materials
- multilayer nanostructure

Research Support and Technology Transfer Department
telephone: +39 011 090 6317 - email: innovazione@polito.it

POLITECNICO DI TORINO

Photonic nanostructure for the amplification and targeting of light radiation

Description

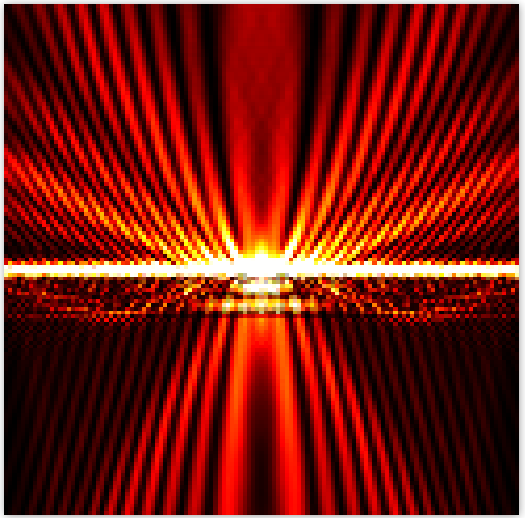
The nanostructure consists of a one-dimensional photonic crystal or a plurality of overlapped thin layers, made of partially transparent dielectric material with a thickness variable between tens and hundreds of nanometers. The surface of the proposed device constitutes the interface to the external environment and has a periodic geometry that is compatible with the working wavelength. In a possible configuration, the diffractive granting is composed by a plurality of concentric and coaxial rings. The physical effect behind its operation provides for a transfer of energy from the emitters to the surface modes that are resonant within a specific range of excitation. Furthermore, such innovative characteristics allow to overcome the traditional limitations inherent to the technologies that are currently available on the market and therefore result into an increased efficiency in addition to an enhanced targeting of the light emitted, which is conveyed towards preferred orientations rather than being distributed isotropically.

Applications

The main uses of the device for the amplification and targeting of light radiation are directly related to all those systems that can exploit the photon management techniques implemented by fully dielectric nanostructures. In particular, the proposed invention finds application within the area of fluorescence based sensoristic, in the biomedical field and in the sector of lighting through emitting diodes made of traditional and organic semiconductor materials.

Advantages

The systems designed and built for controlling and targeting the electromagnetic radiation are based on the optical guiding implemented in photonic crystals or alternatively on nanostructures that make use of noble metals. The proposed device combines the concept of surface waves typical of plasmonic configurations with the use of dielectric materials, allowing to substantially improve the performance of amplification of the light signal and its angular control of emission.



innovazione@polito.it

Priority Number: TO2014A000215