Silicon On Sapphire Based Plasmonic And Metasuraface Design For Optical Light Manipulation

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BRIEF DESCRIPTION

The technology is a high contrast optical grating.It features patterned silicon on sapphire and is designed for a broad range of optical frequencies: from visible to far infrared with ultra-high reflectivity.The technology can be tailored to mimic mirrors and other optical components.

FULL DESCRIPTION

This invention uses silicon on sapphire technology to develop plasmonic and metasurfaces to manipulate light.It is a flat surface, easy to stack, and through easy patterning, it can perform one or more functions at a time, such as both the focusing and diffracting of light. Specific examples are reflectors, focusing lenses, gratings, wavefront manipulators, Talbot lenses and imagers. It is specifically designed for optical frequencies from visible to far infrared wavelengths, where other materials cannot cover such a broad range.This is accomplished by the use of silicon and sapphire as materials as silicon gratings on a sapphire substrate have the advantage of both high index contrast and low loss in mid-IR.

Adaptive optics and wavefront engineering is the study of how to improve the performance of optical equipment by minimizing the effect of deformations in light wavefronts. Much of current optical technology relies on curved surfaces or thick materials to manipulate light. For example, light is focused through a lens, or diffracted through gratings.These current technologies work well for some applications, but the disadvantages of these approaches are that they are bulky, lossy and perform only a single function at a time. Sub-wavelength, high-index contrast gratings have been developed as a super-high performance reflection surface.High contrast gratings are a single-layer grating, with structures spaced with a period near one optical wavelength and where the grating material has a high index of refraction. They are useful in high performance optical systems because, among other features, they have ultra-high reflectivity, can be ultrathin, and can be tailored to mimic mirrors and other optical components.

However, previously developed gratings were identical everywhere in their patterning and only utilized the macroscopic high-reflection property of the sub-wavelength grating.Furthermore, all these designs are focused in visible and near-IR spectrum and no general design methodology is present.This technology is designed for a broad range of optical frequencies, from visible to far infrared and is a general methodology for the design of an arbitrary wavefront profile.

SUGGESTED USES

Components for high performance optical system

ADVANTAGES

- Low loss for a broad wavelength range
- High index contrast for low loss reflectors for infrared frequencies
- High numerical aperture flat lenses ·Can be used to make flat and thin optical devices

INVENTORS

- Boyraz, Ozdal

OTHER INFORMATION

CATEGORIZED AS

- **Communications**
  - Internet
  - Networking
- **Computer**
  - Hardware
- **Energy**
  - Lighting
  - Transmission
- **Engineering**
  - Engineering

» High power efficiency

RELATED CASES

2014-982-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,726,794	08/08/2017	2014-982

LEAD INVENTOR

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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Dynamic Target Ranging With Multi-Tone Continuous Wave Lidar Using Phase Algorithm