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Transformation Optics Based Lift for Large View-Angle, Phase-Undisturbed Optical Imaging

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1. Introduction

Controlling the propagation of light is always an interesting research topic for a variety of applications such as light trapping, display and imaging. Recently, using the invariance of Maxwell's equation, transformation optics has provided a new method to design devices for manipulating light propagation [1] [2]. Here, based on transformation optics, we experimentally demonstrate a two-dimensional optical lift with large viewing angle for the light in visible wavelength. The device is made of a single piece of calcite crystal with n_e=1.66, and n_o=1.48, which is a natural homogeneous birefringent material with low-loss in visible regime.

2. Simulation

First, the simulation of light propagation, using the software COMSOL Multiphysics, is executed. Fig. 1(a) shows the result of light propagation with calcite (n_e=1.66, and n_o=1.48), while Fig. 1(b) shows light reflected by the same mirror located above the original position with an increased height of h. The thickness of the calcite *H* is 19.8 mm. Compare the two output beams, obviously, the phases in these two situation are identical.

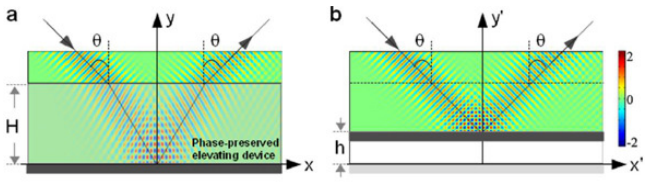

Fig. 1 The simulation of phase-undisturbed optical imaging lift effect

3. Experiment

The dimension of this optical imaging lift is 10 mm (W) x 40 mm (L) x 19.8 mm (H). Fig. 2(a) shows the images when light only reflected from mirror, while Fig. 2(b) shows the images when light reflected from mirror covered by the designed calcite.

Fig. 2 The experimental results with different wave-length.

4. Conclusion

The phase-undisturbed optical imaging lift with large view-angle is developed and verified both in simulation and experiment.

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