Transmissive metamaterial color filters

Yoshiaki Kanamori, Daisuke Ema, Kazuhiro Hane

Tohoku University
E-mail: kanamori@hane.mech.tohoku.ac.jp

1. Introduction

Color filters are indispensable for imaging devices, liquid crystal displays, and so on. Color filters are divided by two types that are transmissive and reflective types. In the field of electrical device applications such as image sensors and displays, transmissive color filters are more useful than reflective filters. Currently, transmissive color filters with pigments are commonly used.

Since the first demonstration of transmissive structural color filters which produce three primary colors from the same substrate has been carried out by Y.Kanamori *et al.*[1], structural color filters have been have been studied intensively in recent years. Recently, many plasmonic color filters have been reported. However, transmissive color filters are a few compared with reflective one.

In this study, we design transmissive plasmonic color filters. Our color filters have two-dimensional periodic structures with polarization independency at normal incidence. By combining with high refractive index layers underneath of plasmonic structures, wavelength selectivity is improved.

2. Design

Figure 1 shows a cross sectional schematic view of proposed transmissive color filters. They mainly consist of plasmonic structure of Al covered with SiO_2, waveguide layers of HfO_2 with high refractive index, and SiO_2 substrates. The plasmonic structures have two-dimensional periodicity with a period of Λ.

3. Results

Figure 2 shows a scanning electron microscope (SEM) picture from a perspective view of fabricated structure with a period of 450 nm, as one example of fabricated color filters. Al periodic structures are fabricated as designed.

Figure 3 shows measured transmittance of fabricated color filters as a function of wavelength. Transmittance peaks are clearly observed according to Λ.

4. Conclusions

We fabricated transmissive plasmonic color filters with polarization independency at normal incidence. Transmittance peaks are clearly observed according to Λ.

Acknowledgements

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References

[1] Y. Kanamori *et al.*, IEEE Photon. Technol. Lett. **18** (2006) 2126.

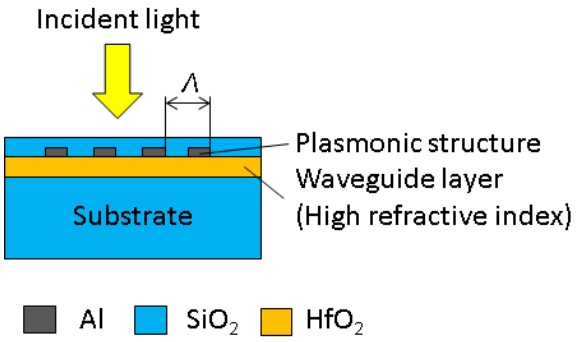

Fig.1. A cross sectional schematic view of proposed transmissive metamaterial color filters.

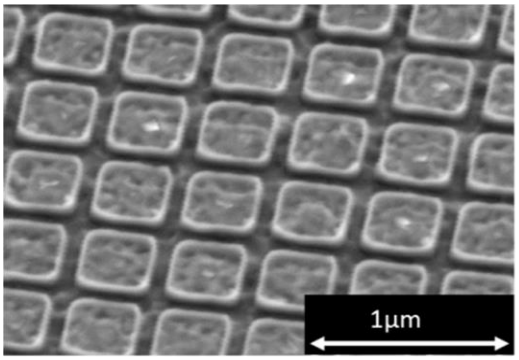

Fig.2. An SEM picture from a perspective view of fabricated structure with a period of 450 nm.

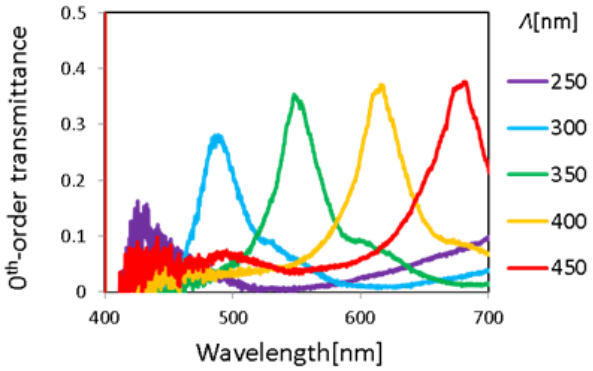

Fig.3. Measured transmittance of fabricated color filters as a function of wavelength.