Dear Editors,

We thank you for sending us reviewers’ comments on our manuscript titled “Design of Polarization-Independent and Wide-Angle Broadband Absorbers for Highly Efficient Reflective Structural Color Filters”. The reviewers provide enthusiastic comments and recommend publication in Materials after major revisions.

In the following pages, we list comments from these Reviewers, our responses to them, and our associated revisions to the manuscript. We believe that these modifications make the manuscript suitable for publication in Materials.

Thank you again for your time and attention.

Sincerely,
Prof. Seungyong Han
On behalf of all authors
Reviewer #3

Summary: “The paper has technically sound in terms of analyzing the proposed Fabry-Perot structure in terms of its reflectance at specific wavelengths. The selection of materials such as dielectric layers and metal layers are well supported by the analytical solutions. However, I have some comments on the paper.”

Our response: We thank the reviewer for the positive remark.

Comment #1: “It will be good to add some descriptions with equations on the method of getting the presented result for casual readers. It seems discussion about the calculation of the result is not very well described in the paper.”

Our response: We thank the reviewer for this suggestion. In revisions, we added more descriptions associated with the working principle of the proposed color filter structure: “In the proposed color filter structures consisting of anti-reflective coating (SiO2) – lossy mirror (Cr) – cavity medium (TiO2) – highly reflecting mirror (Al), a highly lossy metal like Cr is chosen as a top mirror to render the Q-factor of the Fabry–Pérot (F-P) cavity lower so that the broadband absorption resonance is attained. The absorption resonance corresponds to the valley in the reflection. Controlling a bandwidth of the absorption resonance and a free spectral range in a proper manner allows a reflection peak to be created for the reflective RGB color generation. In Figure 3, the reflection peak doesn’t correspond to the F-P resonance, while reflection valleys correspond to the F-P resonance.”

Comment #2: “About application study (page 2, line 62~63) – How the proposed device can be applied to display technologies, light-emitting diodes, and imaging sensors? First, the proposed design is a reflective device which has a full mirror on one side of the Fabry-Perot mirrors. If both mirrors are partial mirrors, the presented advantages of the device are still valid? If those are, please add some supporting analysis or arguments in the paper. Secondly, the color selection of the device is performed by changing the thickness of the TiO2 layer. In order to use the device for display or imaging sensors, there must be different thicknesses at each pixel. How can multiple thicknesses be achieved with high precision at different locations? In my opinion, to make the statement of the authors on applications strong, these two issues should be addressed properly.”

Our response: We thank the reviewer for highlighting this point. We agree with the reviewer that our approach would not be suitable for display and imaging applications because the thickness of the cavity medium needs to be varied to tune the colors although the individual color pixel can be created by three separate lithographic processes. Although we also tried to employ both optically thin mirrors in the structural color filter devices to see if the transmissive RGB colors can be achieved, the transmission efficiency was found to be pretty low because a highly lossy metal (Cr) is used to exploit the broadband resonance behavior. Thus, we believe that it is necessary to modify the introduction regarding the application study.

In revisions, we removed the unsuitable applications such as display, printing, and imaging pointed out by the reviewer, and included other potential applications such as color decoration devices, microscopy, wavelength-selective photodetectors, and colored solar cells in the abstract, introduction and conclusion.