

Optical Properties of $Al_2O_3 - Ni - Al$ Nano-Composite Films

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Extended Abstract

In the nature, there are a variety of organisms and minerals that produce colors as a result of nanostructures that interacting with light. This phenomenon is called structural colors. Structural colors are based on several basic optical effects, including thin layer interference, diffraction, and light scattering. [1] Compared to pigmented colors, structural colors have many useful properties, including iridescence, high reflectance, and polarization. These optical properties have been applied in many fields such as color displays, decorations, anti-counterfeiting and fluid sensors. [2]

Among the many structural color studies, we have examined the optical properties of the porous alumina film formed using Aluminium Anodic Oxidation(AAO). Specifically, their studies were reported that porous thin films formed by AAO processes produces bright colors in the visible range. [3] In addition, fabricated alumina – nickel film by AAO process and electroplating has been reported to exhibit structural color.[2]

In this study, to improve the nanostructure color using the metal light scattering effect. Aluminum was deposited by sputtering on the nanocomposite film fabricated by the AAO process and the electroplating process. The AAO process was performed by applying a voltage of 20 V in 0.1 M sulfuric acid electrolyte. The pore diameter of the formed porous alumina was 25 nm, the depth was formed to 600 nm. After the AAO process, nickel thickness of 50 nm was formed using an electroplating process using AC. Thereafter, aluminum was deposited on the nanocomposite film having a thickness of 20 nm using a sputter.

The optical characteristics were then analyzed using reflectance measuring equipment. The wavelength of the used light was reflected in the visible light range from 300 nm to 800 nm, and the reflectance of the alumina-nickel-aluminum film was increased by 5% compared to the alumina-nickel film.

Acknowledgements

This research was funded and conducted under [the Competency Development Program for Industry Specialists] of the Korean Ministry of Trade, Industry and Energy(MOTIE), operated by Korea Institute for Advancement of Technology(KIAT).(P0002092) and Industry and Energy and Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2017R1D1A1B03036123).

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