〈技術資料〉

金属酸化物薄膜の電気・光学特性制御と抗菌材料への応用

Tailoring of Electrical and Optical Properties of Metal Oxide Thin Films and Their Application to Antibacterial Materials

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Abstract

We have proposed materials design to achieve highly transparent conductive Ga-doped ZnO（GZO）films grown on alkali-free glass substrates. The choice of dopants that will enable us to stabilize oxygen atoms in the vicinity of the dopant sites is essential. To tailor the film properties that meet the requirements of applications is the optimization of film thicknesses and refractive index. GZO films exhibit their unique antibacterial properties. We have proposed a model of the antibacterial activity caused by the presence of superoxide（O_2^-）ions of GZO-film surfaces. Our state-of-the art technology of the generation and irradiation of negatively charged oxygen（O^-）ions is an effective way for oxidation of metals and oxide-semiconductors to achieve advanced functional materials. The technology without intentional heating of Cu-plate substrates would allow tailoring of Cu_2O layers with an abrupt interface of Cu_2O films/Cu substrates, to make the materials the various colors. To investigate the characteristics of Cu_2O films/Cu substrates, we showed optical reflectance and demonstrated CIE 1976（L^*, a^*, b^*）color space for measuring the object colors of Cu_2O films/Cu substrates.

キーワード：酸化亜鉛、抗菌、亜酸化銅、無アルカリガラス基板、無酸素銅基板
Keywords: Zinc oxide, Antibacterial, Cuprous oxide, Alkali-free glass substrates, Oxygen-free copper plate-substrates

1.　緒言

塗料が原材料の分散、そして溶解行程を経て製造され、次に塗装工程経過の中、塗膜生成過程で顕在用途が要求する機能が発現される。一方、無機金属酸化物系材料を基にする薄膜の研究開発でも上記と同様な過程を経る。具体的には、原材料（ホスト材料と機能発現のための添加材料を含む）が分散された粉末を成型（molding）し、焼結（sintering）することで成膜用原料を得る。我々は真空（例：全圧は0.2～0.5Pa 程度）条件下での薄膜成長行程（基板温

2021年11月30日受付
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