# 기판에 따른 p-type $CuCrO_2$ 박막의 성장방향변화

# Orientation control of $CuCrO_2$ films on different substrate by PLD

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**초 록 :** Epitaxial $CuCrO_2$ thin films have been grown on single crystal substrate of c-plane $Al_2O_3$, $SrTiO_3$, YSZ and Quarts by laser ablation of a $CuCrO_2$ target using 266nm radiation from a Nd:YAG laser. X-ray measurements indicate that the $CuCrO_2$ grows epitaxially on all substrate, with its orientation dependent on the kinds of substrates. Most of the layer were polycrystalline with (00l), (015) and random as the dominant surface orientation on c-plane YSZ, $SrTiO_3$ and quarts substrate, respectively. (00l) orientated $CuCrO_2$ grows on C-plane $Al_2O_3$ and YSZ substrate, (015) orientated $CuCrO_2$ films are found on c-plane $SrTiO_3$ substrate and random orientated $CuCrO_2$ films grows on quarts substrate. These data are compared with the in-plane orientation and the mismatch of the $CuCrO_2$ and each substrate lattices in an attempt to relate the preferred orientation to the plane of the sapphire on which it is grown. Further characterization show that the grain size of the films increases for a substrate temperature increase, whereas the electrical properties of $CuCrO_2$ thin films depend upon their crystalline orientation.

## 1. 서론

Delafossite structure oxides have been known as one of the possible p-type TCOs due to their wide bandgap and preference of covalent bonding. Those delafossites with Pd or Pt as the univalent cation are metallic. Those with Cu or Ag are semiconducting. Highly anisotropic electrical conductivity is observed for both metallic and semiconducting crystals. The conductivity is typically 1000 times higher along the c-axis compared to perpendicular to the c-axis[1]. Growth temperatures and types of substrates are important to preferential orientation of epitaxial films. Transitions of orientation can occur by the change of growth temperature or substrate. If anisotropic conductivity properties of $CuCrO_2$ are controlled, we respect interesting applications.
In this work, we report on the structural properties of epitaxial $CuCrO_2$ films grown on different substrates using pulsed laser deposition. $CuCrO_2$ films having various orientations have been grown epitaxially on c-plane sapphire, c-plane YSZ, c-plane STO and Quarts substrate. Epitaxial films grown on different substrate showed different growth orientation and surface morphology. We assumed the different growth modes were affected by surface energy and strain energy. The electrical properties of preferentially oriented $CuCrO_2$ films on different of substrate will be discussed.

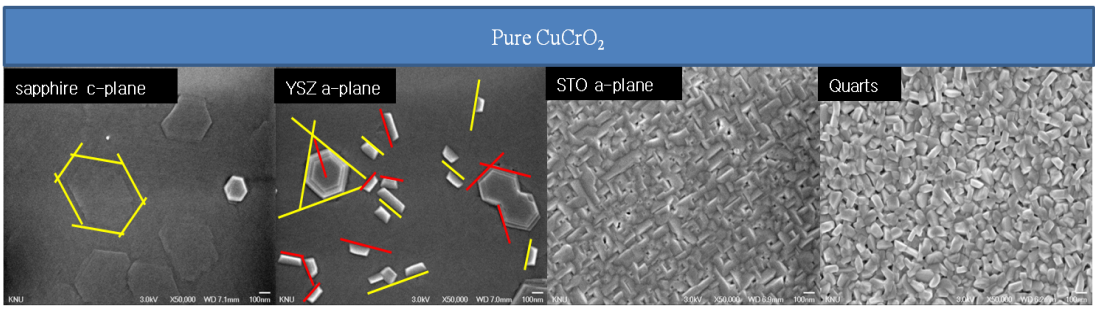


**Fig. 1. SEM images of $CuCrO_2$ thin films grown on different substrates**

## 참고문헌

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