Fabrication of Highly {110}-oriented $Ba(Ce,Y)O_3$ Perovskite Thin Films by RF-magnetron Sputtering Method

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10mol% Y-doped $BaCeO_3$ (BCYO) perovskite thin films were directly deposited on (111)Pt/TiO_2/SiO_2/Si (abbreviated as Pt/Si) substrates by an RF-magnetron sputtering method. The deposition conditions including deposition temperature, sputtering pressures, and kinds of sputtering gas were examined to obtain well-crystallized BCYO thin films. The deposited films were characterized by the powder X-ray diffraction (XRD) with CuKα radiation and the field emission scanning electron microscopy (FE-SEM). The wide-range reciprocal space mapping of θ-2θ and ψ-2θ scans were also employed to investigate their preference of crystallographic orientations.

Figure 1 shows a wide-range reciprocal mapping image and its integration of the BCYO thin films. The strong spots of {110} BCYO were observed at 2θ=28.7°, ψ=0, 60° and (200) BCYO at 2θ=41.1°, ψ=45°, which means highly {110} -oriented BCYO films with pseudo-cubic structure can be deposited directly on the Pt/Si substrates. Though we have already reported the preferred orientation control in <110> direction of perovskites on Pt/Si substrates by using a (101)PdO//(111)Pd buffer [1], this results suggests we have successfully deposited {110}-orientated perovskite thin films without using any buffer layers. We consider this BCYO thin film can be used as a seed layer to obtain {110}-oriented perovskites.

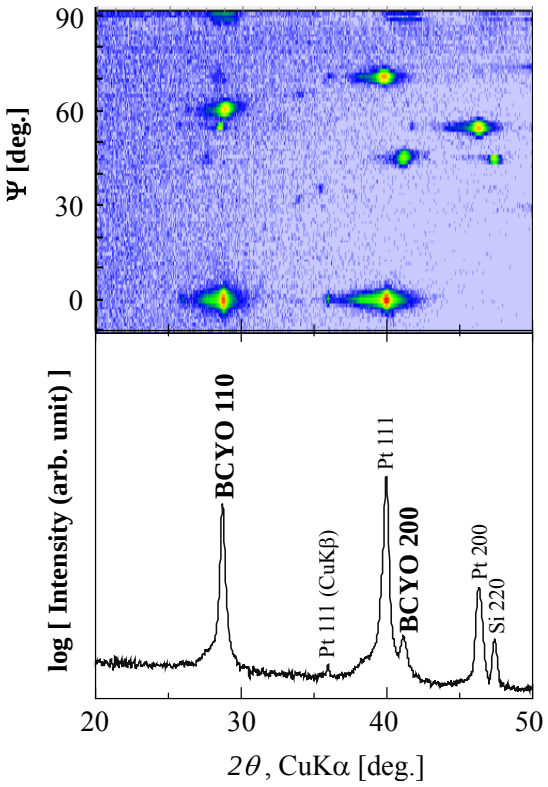

Fig.1 A wide-range reciprocal mapping image and its integration as θ-2θ scan of the BCYO thin films. The crystal plain indexes in this fig. are denoted assuming pseudo-cubic structure.

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