Homo-buffer layer effect on ZnO nanorods grown by MOCVD

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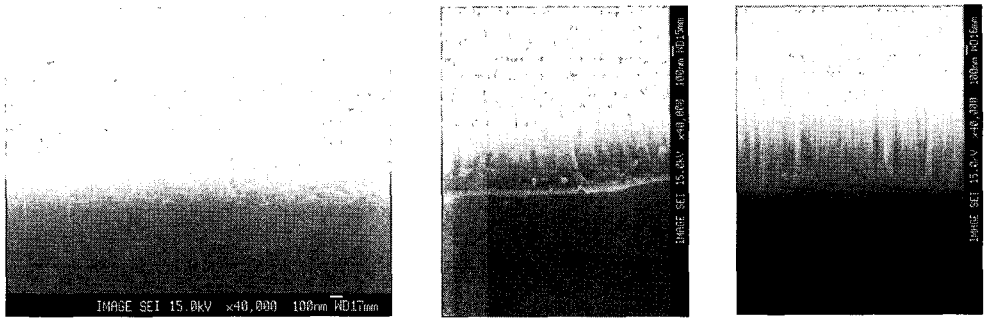
We present the crystal quality enhancement of ZnO nanorods with a ZnO buffer layer on Al_2O_3 substrates. In general, a natural thin film was observed in the beginning of ZnO nanorods growth by a catalyst-free metal organic chemical vapor deposition. Orientation-dependent x-ray absorption fine structure (XAFS) revealed that the film had a wurtzite structure with a substantial amount of disorders and distortion, along the c-axis and in ab-plane. In this study, we demonstrate that the film played as a buffer layer for high quality ZnO nanorods growth, reducing the lattice mismatch between the ZnO and substrates. We intentionally deposited ZnO films with thickness of 250nm on the Al_2O_3 substrates *in-situ*. ZnO nanorods which were grown for 10, 20 and 30 min were grown on the bare Al_2O_3 substrates and the homo-buffer layer. The surface and cross-sectional morphology were investigated by field emission scanning electron microscopy (FE-SEM). For the structure property study of the specimens, x-ray diffraction (XRD) measurements were performed. The XRD result demonstrated that the crystalinity of the nanorods was highly improved with the homo buffer layer.



(a) (b) (c)

Figure. FE-SEM image of (a) ZnO homo-buffer layer, (b) ZnO nanorods grown on the bare Al2O3 substrates, for 30 min and (c) ZnO nanorods grown on the homo-buffer layer, for 30 min.