Formation of branched ZnO nanostructures by thermal evaporation process: Formation mechanism, structural and optical properties

Umar Ahmad, 김상훈, 모하메드 바즘, 박용규, 김진환, 김정현, 한윤봉*
전북대학교
(ybhahn@chonbuk.ac.kr*)

Branched ZnO structures composed of hexagonal ZnO nanorods have been successfully synthesized, in large-quantity, by the thermal evaporation process using metallic zinc powder in the presence of oxygen at 600 °C. The morphological investigations by FESEM revealed that the small ZnO nanorods having the lengths and diameters of about 1.5 ~ 2 um and 30 ~ 40 nm respectively were grown along the single nanowires. The detailed structural characterizations by HRTEM, XRD and SAED confirmed that the as-grown ZnO branched structures are single crystalline and all the nanorods in the branched structure is grown along the [0002] direction in preference. A sharp and strong UV emission has been obtained from the room-temperature PL spectrum which confirmed that the as-grown products have good optical properties. Moreover, presence of a strong and sharp E2 (high) mode in the Raman-scattering spectrum shows that the branched ZnO structures have good crystallinity with the wurtzite hexagonal phase. Finally, a plausible growth mechanism has also been proposed for these branched ZnO structures.