

Formation of ZnO nanostructures on silicon substrate by cyclic feeding chemical vapor deposition: Structural and optical properties

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Well-crystallized ZnO nanostructures were grown on Si(100) and Si(111) substrates by the cyclic feeding chemical vapor deposition (CFCVD) process with and without the use of metal catalyst or additives using diethyl zinc and oxygen for the sources of zinc and oxygen, respectively at low temperature ranges between 400–500°C. By clear morphological investigation using FESEM, it has been observed that a variety of ZnO nanostructures such as star-shaped, flower-shaped, hierarchical nanostructures, nanorods, bone-shaped nanostructures, multipod ZnO nanocrystals, etc are obtained by varying the reaction parameters. The detailed structural characterizations show that the grown nanostructures are single crystalline with wurtzite hexagonal phase and preferentially grown along the [0001] direction. A strong, sharp and dominant UV emission with a suppressed green emission was observed from the room temperature photoluminescence (PL) spectra which confirm the good optical property for the as-grown nanostructures.