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Growth of ZnO nanowires by thermal evaporation on Si substrate without catalyst and their temperature dependent photoluminescence

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ZnO nanowires have been directly grown at 600°C by thermal evaporation using the Zn powder under controlled conditions without the presence of catalyst. These ZnO nanowires in the diameter of ~50nm long and lengths of tens of micrometers.

High-resolution transmission electron microscopy showed these ZnO nanowires were mostly crystalline structure. X-ray diffraction measurements indicated that the ZnO nanowires were wurtzite crystal structure and grew non-epitaxially on Si substrate along ZnO [0001] direction. Temperature-dependent photoluminescence measurement of the annealed ZnO nanowires has been carried out and it showed that both the excitonic emission and the deep level emissions decreased with annealing gases.