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Synthesis and growth mechanism of ultra-long ZnO nanocombs and nanobelts on Cu substrate

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Due to the successful preparation of macro-scale carbon nanotubes which can be applied in electronics and mechanics, researchers have a big interest in the synthesis and application of macrostructures whose properties will promote the development of new technology. So far, some ZnO nanostructures with different appearance such as ultra-long nanorods, ultra-long dendrites, ultra-long nanocombs, ultra-long nanobelts, and microbrushes have been successfully reported. Nevertheless, these ultra-long ZnO nanostructures are often grown on quartz boat, they must be stripped and adhered to the substrate for scanning electron microscopy (SEM) characterization and electron field emission testing, which has an effect on the application of ultra-long ZnO nanostructures. Therefore, the preparation of ultra-long ZnO nanostructures on the substrate has become a major challenge.

This paper describes how ultra-long ZnO nanocombs and nanobelts were synthesized on Cu substrate for the first time, and their length are about several hundred micrometers to one millimeter, which can be seen in Fig. 1a, b. As shown in Figure 1c, a little peak of Cu was detected in the spectrum, as the products have a little amount of Cu, Cu is the nucleation site and catalyst during the growth of ZnO nanostructures. The growth mechanism of the ultra-long ZnO nanostructures can be interpreted by the Fig. 1d clearly. These ZnO ultra-long nanostructures will be of great value in electrical devices.

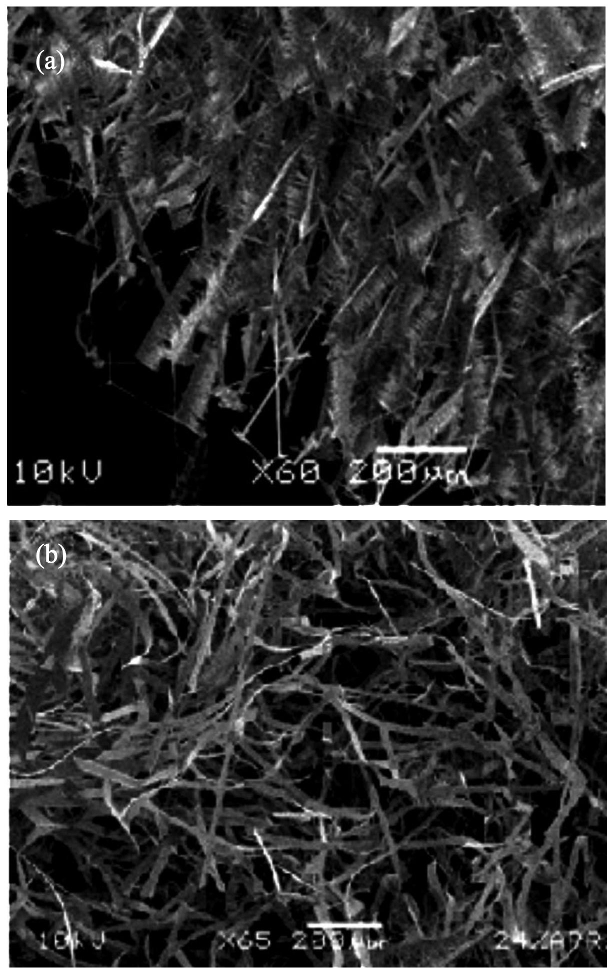

Fig. 1. (a) – Low magnification SEM images of ultra-long ZnO nanocombs. (b) – Low magnification SEM images of ultra-long ZnO nanobelts

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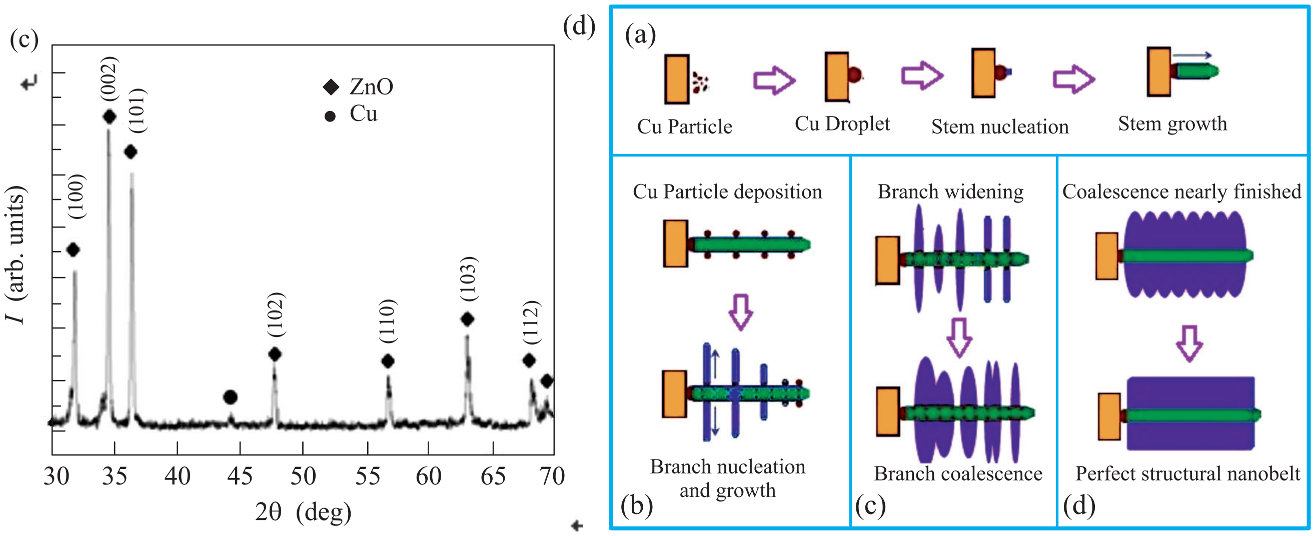

Fig. 1. (Color online) (c) – The X-ray diffraction (XRD) patterns of ultra-long ZnO nanobelts. (d) – The growth mechanism for the nanobelts

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