GROWTH AND CHARACTERIZATION OF ZNO NANOSTRUCTURES BY A SELF-CATALYTHIC CVD PROCESS.

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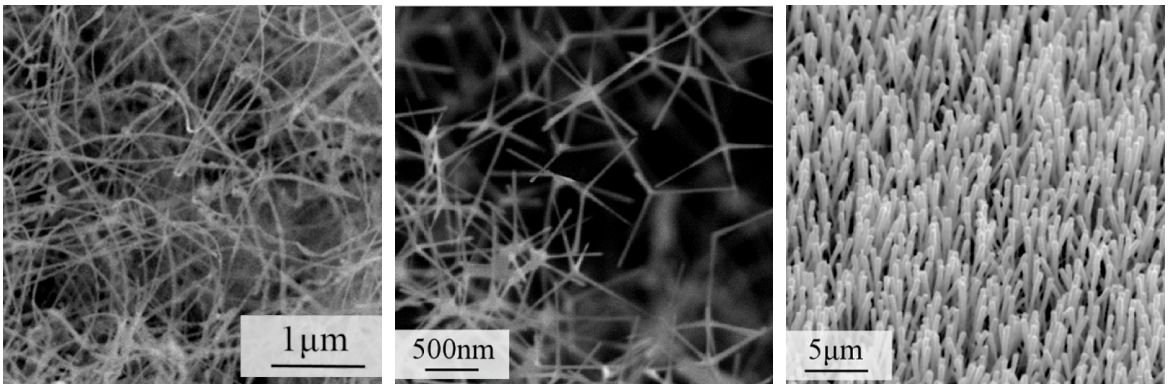
In the last years, many papers have dealt with the topic of metal oxide nanowire growth and characterization. In particular, it is widely reported that Zinc Oxide (ZnO) can be obtained in a large variety of nanostructures with different morphologies, namely nanowires, nanorods, nanotetrapods (or simply "tetrapods"), nanotapes or nanoribbons, etc. The possibility to obtain this material in different nanosized crystalline structures is particularly interesting in view of several application fields, e.g. chemical sensors, solar-cells, optoelectronics. However, different nanostructures often appear mixed on the same substrate, thus limiting the possibility of exploitation for applications.

In this work, we report on the growth of ZnO nanostructures on large-scale by a combination of vapor transport and controlled oxidation in a CVD reactor with a typical bottom-up self-catalytic process. This kind of synthesis process is generally cheaper than the typical top-down ones used for common electronics and so they are suitable for "low-cost" device fabrication.

Using pure metallic Zn (5N) as source material, different growth conditions has been studied and tuned for the large-scale and reproducible preparation of selected nanostructures, like nanowires (fig. 1a), nanotetrapods (fig. 1b), and nanorods (fig. 1c). In particular, no catalyst or organic precursor has been used in the synthesis process to avoid unwanted contaminations, often affecting the properties of these nanostructures.

Crystallographic phase, morphology and defects of the nanostructures were studied at the aid of transmission electron microscopy.

The strong luminescence of the different nanostructures at room and liquid helium temperature was compared.



(a) (b) (c)

Figure 1