Catalyst free growth of well-aligned zinc oxide nanorods

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Recent years, one-dimensional (1D) ZnO nanostructures have attracted much more interest due to its potential application in dye-sensitized solar cell application [1]. Even if many methods reported to successfully fabricate 1D ZnO nanostructures, there many issues have remained for further industrial applications, such as the poor reproducibility, difficult alignment, complicated processes, etc.

In this research, we have successfully developed a novel reducing annealing technique to grow ZnO nanorods (NRs) from as-deposited ZnO film on ITO glass, which was completely different from other current fabrication techniques of ZnO nanostructures. During ZnO NRs growth, the zinc catalysts come from reducing of ZnO film instead of any additional seeds or catalyst. With controlling the annealing parameters, well-aligned ZnO NRs could be obtained with good reproducibility.

ZnO film (thickness 500nm) was deposited on ITO glass by RF (13.5MHz) magnetron sputtering method [2]. Sequentially, the reducing annealing was applied to fabricate ZnO NRs on ZnO film in forming gas (1.9% H\textsubscript{2} in N\textsubscript{2}) at 450°C. The obtained ZnO NRs were shown in Fig. 1. The structural, optical and electric properties of as-deposited ZnO films and obtained ZnO NRs were characterized. The growth mechanism of ZnO NRs will be discussed in this paper.

![Fig. 1 The SEM image of obtained ZnO NRs on ITO glass.](image)