Supplementary Information

Facile, wafer-scale compatible growth of ZnO nanowires via chemical bath deposition: Assessment of Zinc ions contribution and other limiting factors

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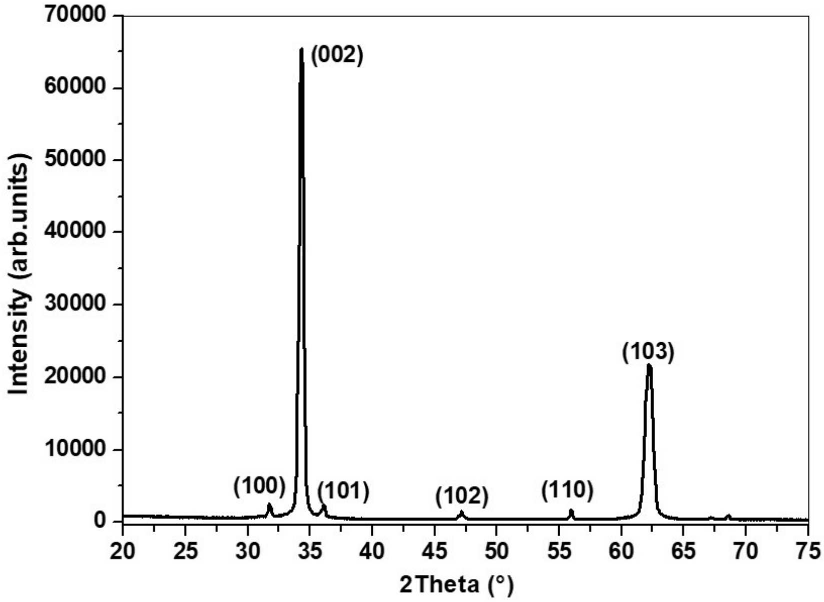

Figure S1: XRD spectrum of highly crystalline ZnO NWs grown on a 3-inch silicon wafer

To confirm the phase composition and the crystallinity of ZnO NWs grown on an entire 3-inch silicon wafer, we have conducted XRD analysis. The XRD spectrum of the NWs is shown in Fig. S1. Peaks corresponding to (100), (002), (101), (110), and (103) planes are observed. All the peaks are attributed to the wurtzite hexagonal ZnO with the measured lattice constants a=3.20A° and c=5.207A°. The strong and narrow diffraction peaks of the XRD pattern indicate that ZnO NWs are highly crystalline and are oriented along the c-axis.

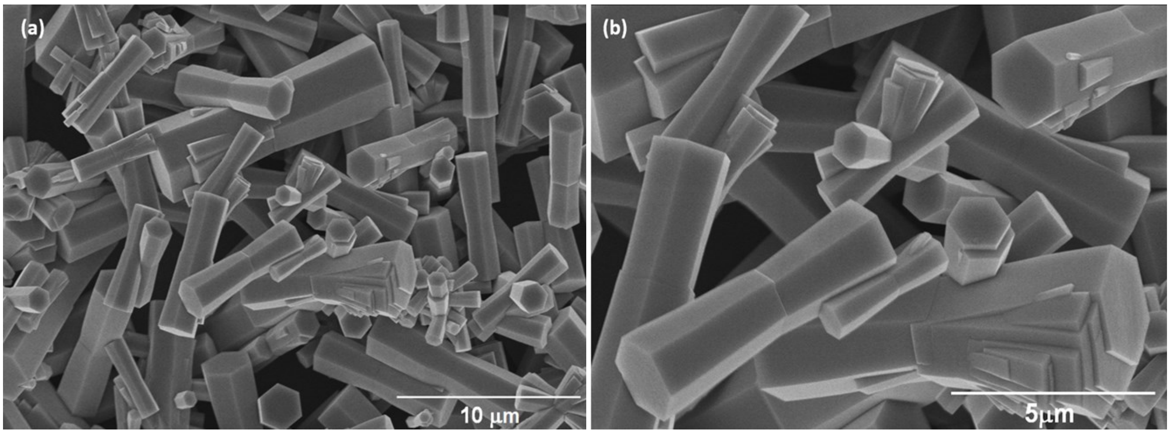

Figure S2(a and b): SEM images showing micron sized ZnO micropods which are formed freely in the solution during the growth of the NWs.

ZnO micropods are formed in abundance in the solution during the synthesis of ZnO NWs by chemical bath deposition. The mass ratio between the NWs and microrods is less than 1%. A large quantity of Zn^{2+} ions present in the solution are involved in the growth of ZnO micropods, whereas only a small quantity of ions is involved in the growth of ZnO NWs. The sedimentation or direct precipitation of micropods is clearly a current limiting factor for the loading efficiency. While being out of the scope of this paper, further study is needed here to address this point. One possibility will be to systematically weigh the sample and the precipitates while varying the concentration of ammonia as complex agent to reduce the sedimentation or adding additives to speed-up the growth of the NWs. These additives include hexamethylenetetramine (HMTA)[1] or ethylenediamine and triethanolamine[2].

1. K.M. McPeak, T.P. Le, N.G. Britton, Z.S. Nickolov, Y.A. Elabd, J.B. Baxter, Chemical Bath Deposition of ZnO Nanowires at Near-Neutral pH Conditions without Hexamethylenetetramine (HMTA): Understanding the Role of HMTA in ZnO Nanowire Growth, *Langmuir*, 2011, **27**, 3672-3677.

2. L. Schlur, A. Carton, P. Lévêque, D. Guillon, G. Pourroy, Optimization of a new ZnO nanorods hydrothermal synthesis method for solid state dye sensitized solar cells applications, *J. Phys. Chem. C*, 2013, **117**, 2993 – 3001.