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Vertically aligned ZnO nanoneedles on Pt(111) substrates by metal-organic chemical vapor deposition and their optical and field emission characteristics

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One-dimensional nanowires of wide-band gap semiconductors have attracted great attention due to their importance both in basic scientific research and in technological potential applications in nano-electronic and optoelectronic devices. Among those, ZnO, a wide bandgap (3.37 eV) semiconductor with a large exciton binding energy (60 meV), has been considered a promising material for short-wavelength optoelectronic devices. Moreover, recent field emission results for the ZnO nanowires indicate a possible application for electron emitter. In this work, we prepared vertically well-aligned ZnO nanoneedles on a metal electrode, Pt(111) substrate, by metal-organic chemical vapor deposition via an initial preparation of a ZnO seed layer without any other metal catalyst. The structural, optical and field emission characteristics of the nanoneedles are identified by SEM, TEM, XRD, XPS, PL, and I-V measurements.