Supplementary material (ESI) for Journal of Materials Chemistry

Supporting Information Available:

Template-free one-step electrochemical synthesis of ZnO hollow nanospheres: Self-assembly of hollow nanospheres from nanoparticles

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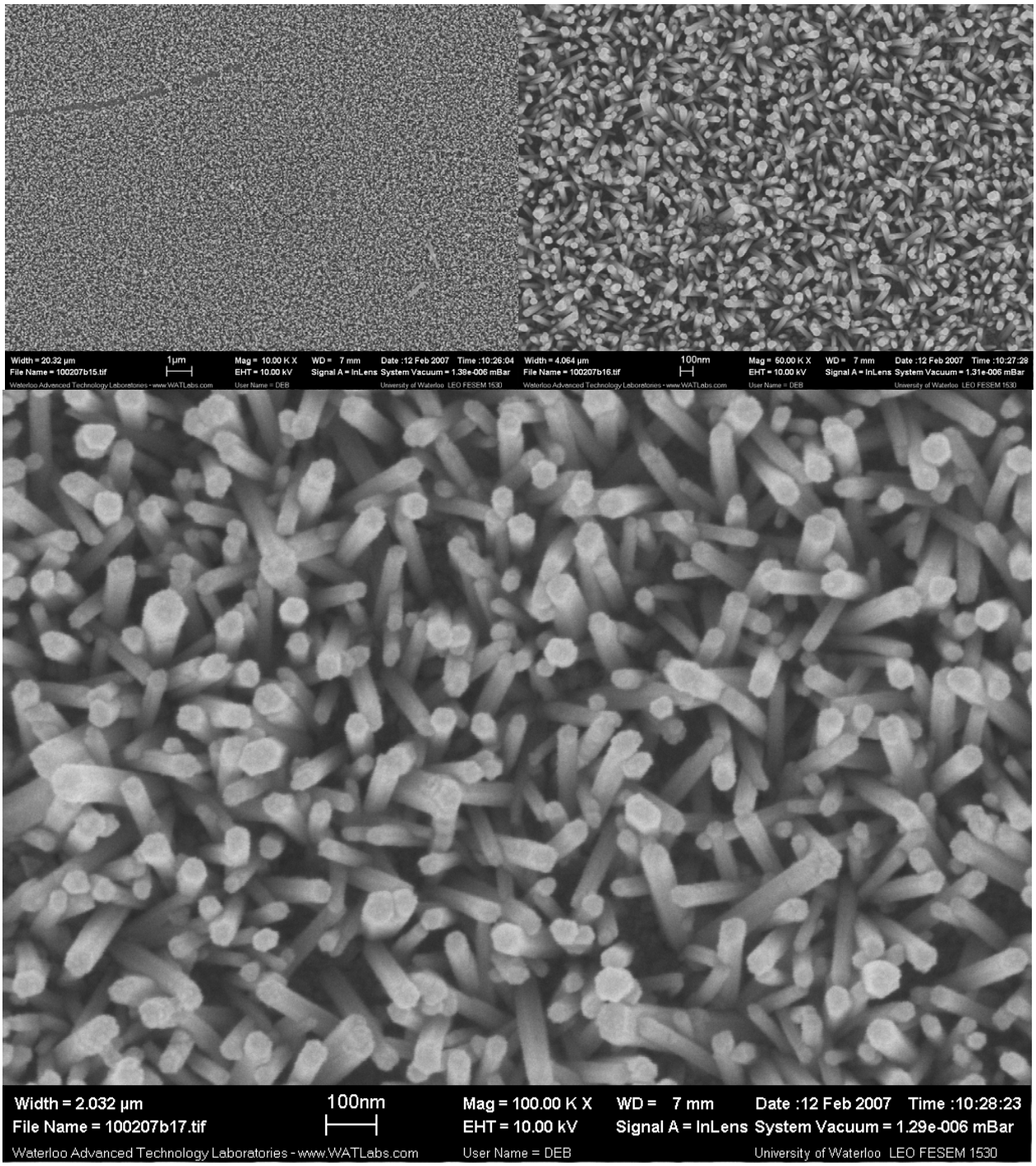
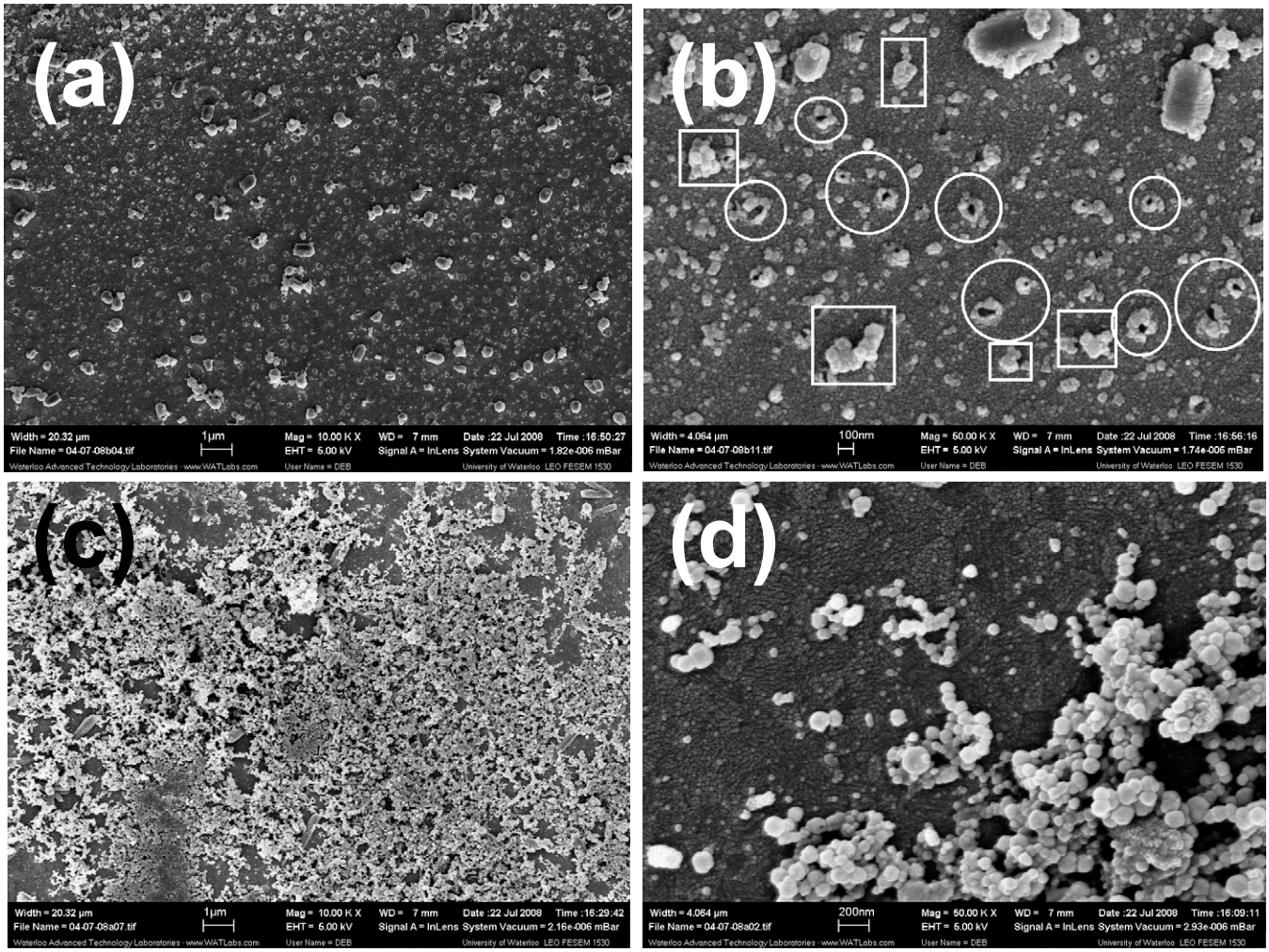
Experimental details

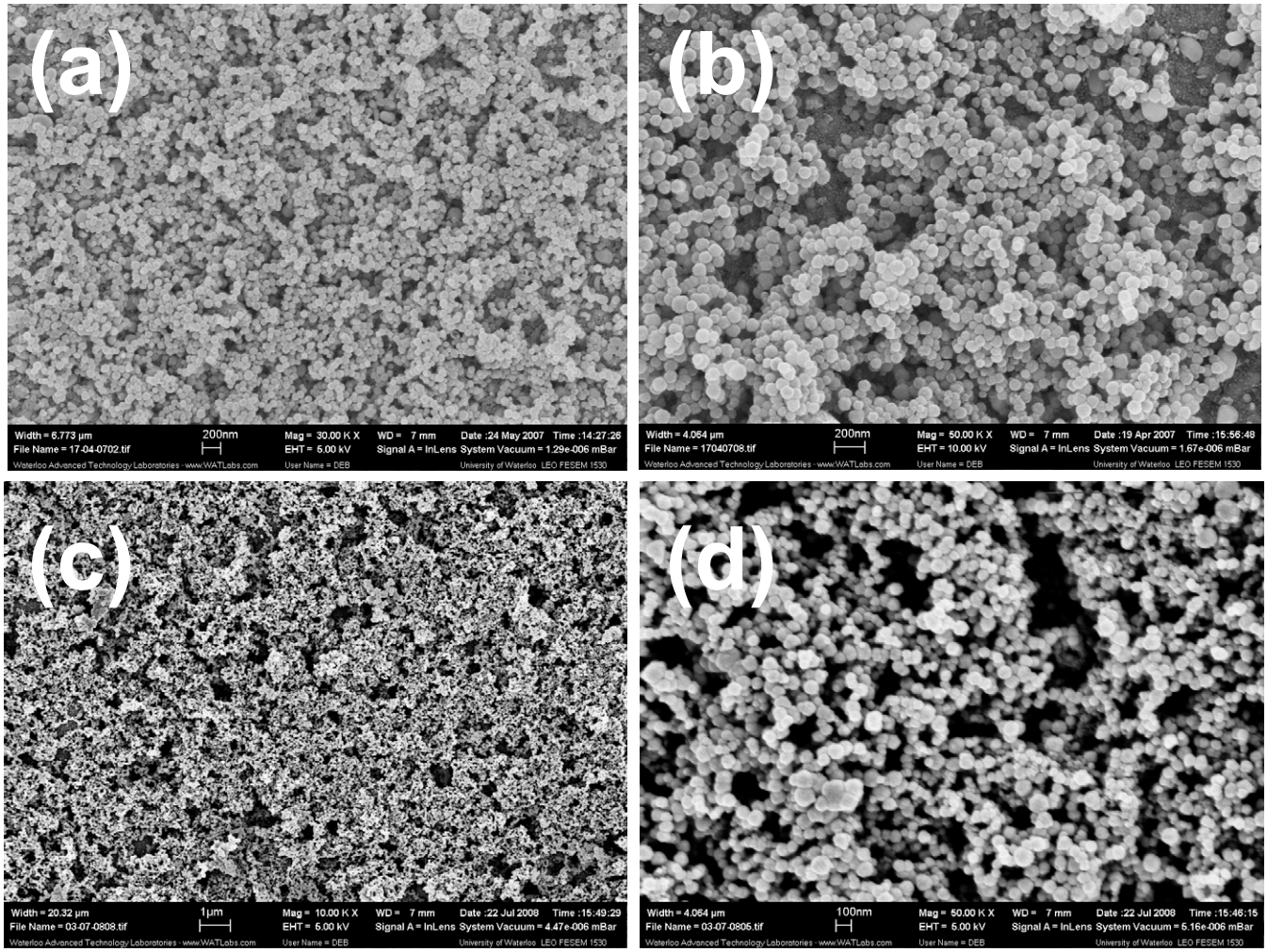
The electrochemical deposition experiments were carried out in a three-electrode glass cell immersed in a water bath held at 70^{o}C. The working electrode was varied to find effect of deposition on different conducting substrates such as ITO-glass, indium oxide or Au coated PET. A Ag/AgCl electrode was used as the reference electrode while a spiral platinum wire served as the counter electrode. An aqueous solution (15 mL) of $Zn(NO_3)_2 \cdot 6H_2O$ (Aldrich) of varying molar concentrations (used as the electrolyte) was mixed with 0.1 M KCl for the electrodeposition. A potentio/galvanostat electrochemical workstation (CH Instruments 660A) was used to deposit the nanostructures by amperometry potentiostatically at –1.1 V (relative to the reference electrode). The deposition times was varied from 30 minutes to 240 minutes to understand the growth evolution of ZnO NSs. The morphologies of the resulting nanodeposits were analyzed by using a LEO FESEM 1530 field-emission scanning electron microscope (SEM). The microstructural characteristics of ZnO NSs were analysed with a JEOL 2010 TEM operated at 200 kV. The crystal structure of the nanodeposits was characterized by GIXRD using a PANalytical X'Pert Pro MRD diffractometer with Cu Kα radiation (1.54 Å) and an incidence angle omega = 0.3°. The surface composition of the ZnO NSs was analyzed by XPS using a Thermo-VG Scientific ESCALab 250 Microprobe with a monochromatic Al Kα source (1486.6 eV).



S1. SEM images of ZnO nanowires on ITO-glass obtained at 70°C with 0.5 mM $Zn(NO_3)_2 \cdot 6H_2O$ mixed with 100 mM KCl after 120 minutes of deposition.



S2. SEM images of ZnO (a,b) nanoparticles after 30 minutes [The circular mark indicates the beginning of hollow structure formation whereas square mark indicates clusters of nanoparticles] and (c,d) NSs after 60 minutes, on ITO-glass at 70°C with 0.1 mM $Zn(NO_3)_2 \cdot 6H_2O$ mixed with 100 mM KCl.



S3. SEM images of ZnO NSs after (a,b) 120 minutes and (c,d) 240 minutes, on ITO-glass obtained at 70°C with 0.1 mM $Zn(NO_3)_2 \cdot 6H_2O$ mixed with 100 mM KCl.