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**The excel file contains raw data for the paper. The detailed description are below:**

**Figure 1** (a) Illustration of the one growth supercycle of the proposed supercycled ALD process. (b) ZnO growth rates as a function of the O2 plasma time for supercycled ALD with fixed thermal cycle (*m* = 1) and plasma-enhanced ALD processes, the dashed curves are guides of eye. (c) ZnO growth rate and linear fitting as a function of the thermal process cycle *m* with fixed O2 plasma times (t3 = 1 and 8 s).

**Figure 2** XRD patterns of ZnO films grown by the supercycled ALD process using (a) different O2 plasma times with fixed thermal cycle (*m* = 1) and (b) different thermal cycle with fixed O2 plasma time (t3 = 1 s).

**Figure 3** (a) Electrical resistivity of ZnO films grown from different O2 plasma times with fixed thermal cycle *m* (solid dots) and different thermal cycles with fixed O2 plasma time (open dots) by the supercycled ALD process (b) Carrier concentration (blue) of ZnO films grown from different O2 plasma times with fixed thermal cycle (solid dots) and different thermal cycles with fixed O2 plasma time (open dots); Mobility (green) of ZnO films grown from different O2 plasma times with fixed thermal cycle.

**Figure 4** (a) – (e) Two dimensional contact potential difference VCPD images of the surface potential measurements of the supercycled ALD grown ZnO films with O2 plasma time (t3) varying from 0 to 8 s and fixed thermal cycle (*m* = 1); (f) average VCPD values with varying O2 plasma times (solid dots) and thermal cycles (open dots).

**Figure 5** Hall-effect and KPFM measurement results of carrier concentration ratios between ZnO films grown with varying O2 plasma times (solid dots) and thermal cycles (open dots).

**Figure 6** XPS spectra and their Gaussian fittings of the O 1s region of the supercycled ALD grown ZnO films with O2 plasma time (t3) varying from 0 to 8 s and fixed thermal cycle (*m* = 1); (f) Percentages of the fitted peaks contributing to the defects (OB).

**Figure 7** XPS spectra and their Gaussian fittings of the Zn 2p3/2 region of the supercycled ALD grown ZnO films with O2 plasma times of (a) 0 s, (b) 1 s, (c) 2 s, (d) 4 s and (e) 8 s and fixed thermal cycle (*m* = 1).

**Figure 8** Electrical resistivity and carrier concentration as a function of the hydroxyl group related OB peak proportion (dashed lines are a guide to the eye).

**Date of data collection: from 2015-2016**

**Information about geographic location of the data collection: University of Southampton**

**Date the file was created: 09/09/17**