

## ZnO 1D Nanostructures Designed by Combining Atomic layer deposition and Electrospinning for UV Sensor Applications

Adib Abou Chaaya,<sup>a</sup> Mikhael Bechelany,<sup>a\*</sup> Sebastien Balme<sup>a</sup> and Philippe Miele<sup>a</sup>

### S11. Roughness of ZnO 1D Nanostructures

Figure S1 shows a high resolution SEM image in order to better illustrate the roughness of the ZnO coating. The roughness was examined as well using AFM measurement on thin film with different thicknesses deposited on Si substrates. The mean-square roughness, calculated from AFM data is reported in Figure S2. Samples of less than 100 nm thick have a smooth surface of no significant roughness. Well-shaped 100-150 nm elevations are observed on surfaces of thicker samples.

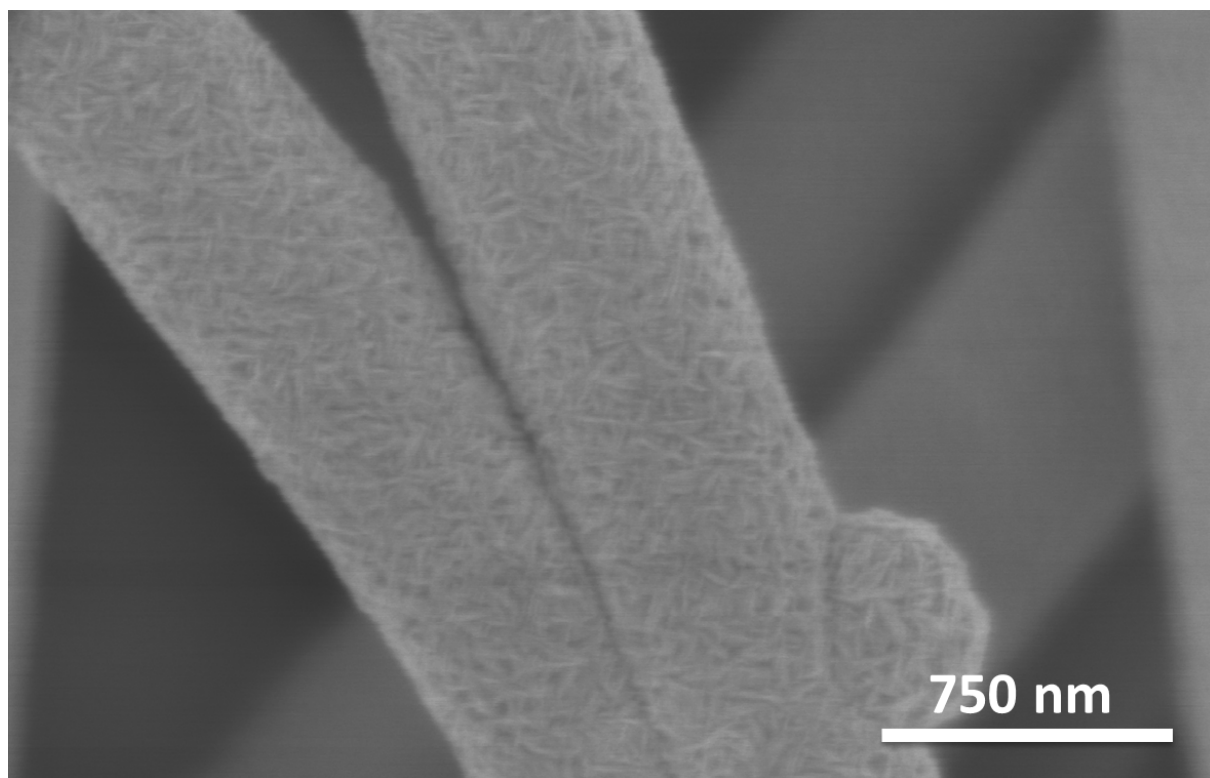
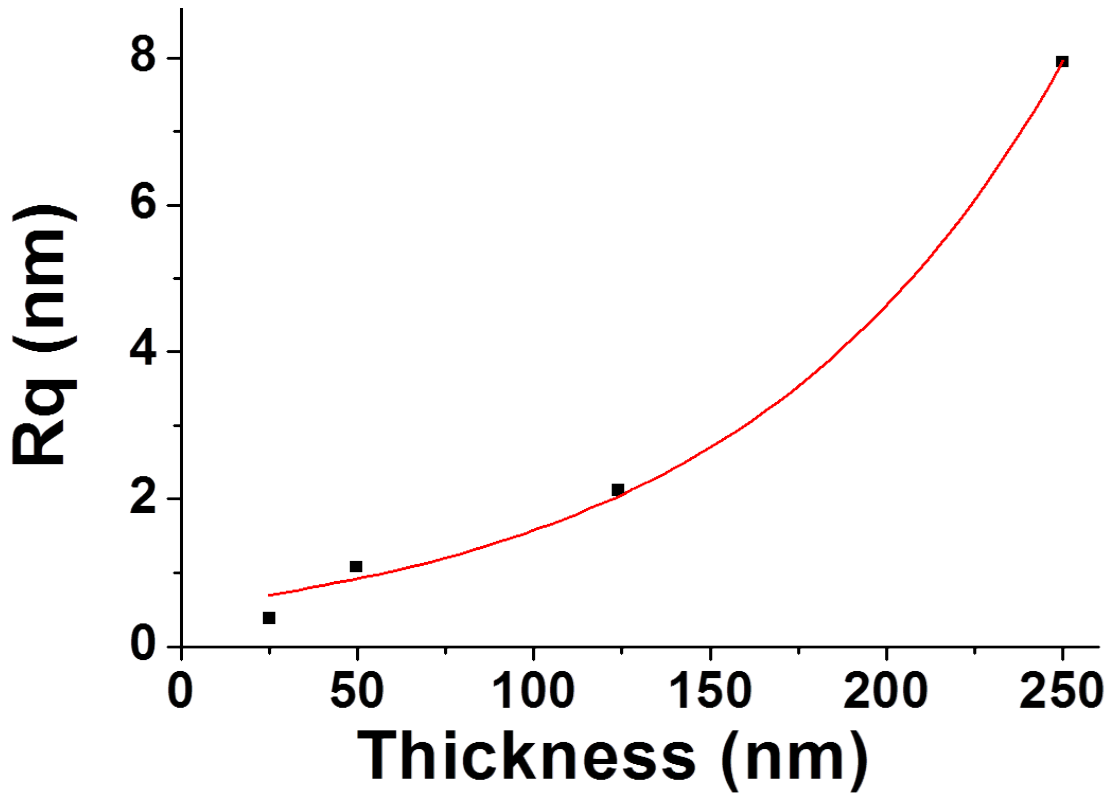


Figure S1. SEM images of 1D ZnO NSs showing the rough surface of the PAN/ZnO 1D NSs



**Figure S2.** Roughness as a function of the film thickness performed on Si substrates

**S12. Grain size calculation**

The grain size was calculated by Debay-Scherer relationship (Equation 1):

$$D = \frac{0.9 \cdot \lambda}{\beta \cdot \cos(\theta)} \quad (\text{Equation 1})$$

Where  $\lambda$  (X-ray wavelength) = 1.6 Å

$\beta$  is the line broadening at half the maximum intensity (FWHM), after subtracting the instrumental line broadening, in radians (See table S1, S2)

$\theta$  is the Bragg angle (see table S1, S2)

**Table 1.** Grain size calculation of 50 nm ALD ZnO elaborated at different temperatures 50, 80, 100 and 130°C.

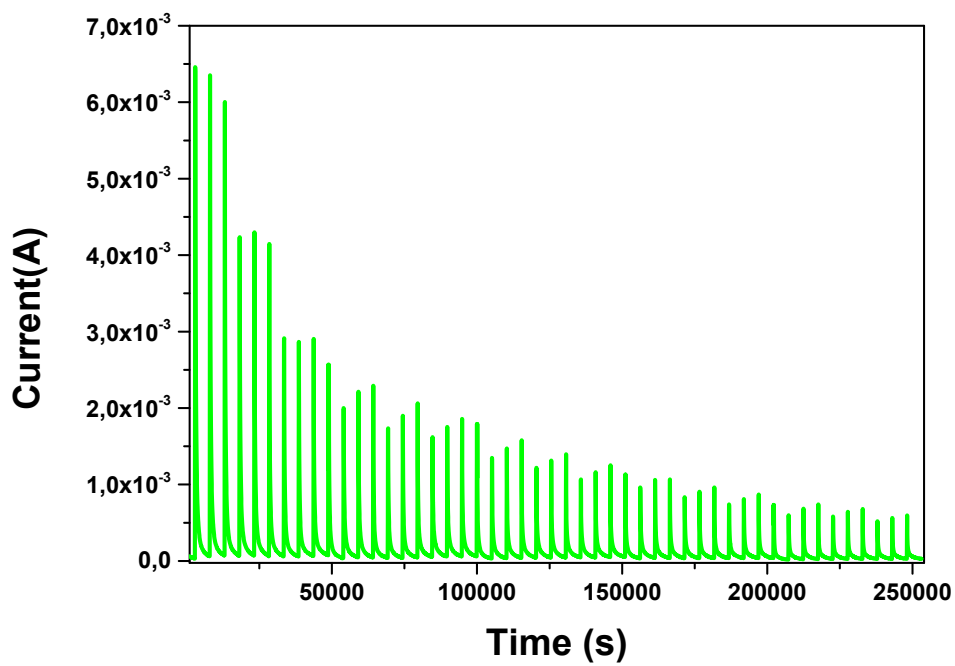
	<i>Bragg angle (2<math>\theta</math>)</i>		
	<i>(100)</i> 31.76	<i>(002)</i> 34.41	<i>(101)</i> 36.25
<i>ALD Temperature (°C)</i>	<i><math>\beta</math></i>		
50°C	0.381	0.460	0.672
80°C	0.447	0.546	0.645

<b>100°C</b>	<b>0.494</b>	0.420	0.532
<b>130°C</b>	0.563	0.495	<b>0.576</b>

**Table 2.** Grain size calculation of ALD ZnO elaborated at 100°C with different thicknesses

	<b>Bragg angle (2θ)</b>		
	<b>(100)</b> <b>31.76</b>	<b>(002)</b> <b>34.41</b>	<b>(101)</b> <b>36.25</b>
<b>Films thicknesses (nm)</b>	<b>β</b>		
<b>50</b>	<b>0.447</b>	0.420	0.532
<b>100</b>	<b>0.417</b>	0.389	0.532
<b>150</b>	<b>0.396</b>	0.494	0.515
<b>200</b>	<b>0.382</b>	0.403	0.508

### SI3. device stability



**Figure S3.** Device stability test of 600 s PAN electrospinning with 250 cycles ZnO at 100°C