Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supporting Information

Porous Nanobranched Structure: an Effective Way to Improve Piezoelectricity in Sputtered ZnO Thin Films

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EDX CHARACTERIZATION

For each sample, EDX spectra were acquired from three different regions, allowing for the calculation of semi-quantitative average values and uncertainties for the atomic concentrations provided in Table 1 of the main manuscript. Figure S1 shows typical spectra for both the compact and porous samples.

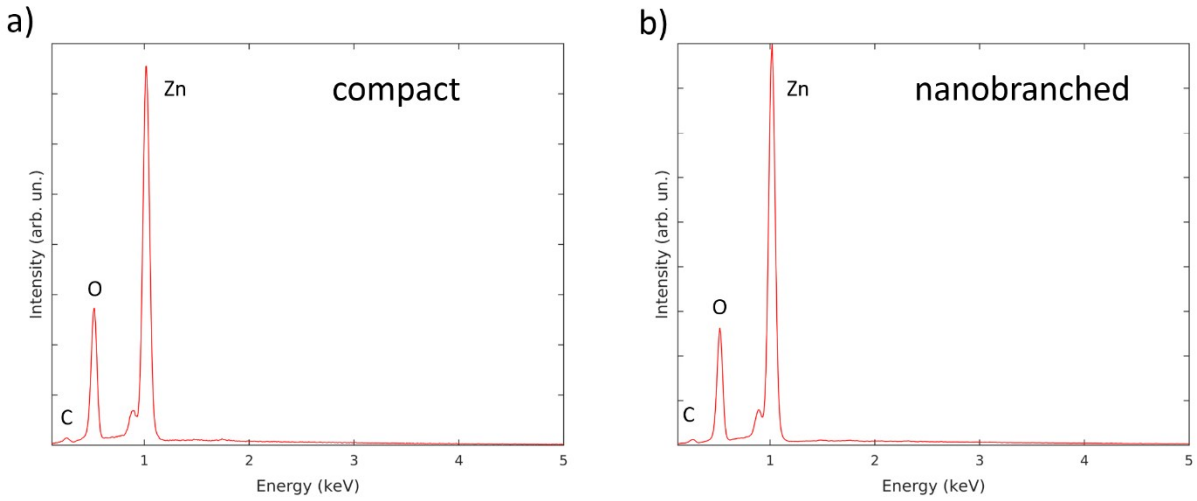

Figure S1. EDX spectra representative of compact (a) and nanobranched (b) ZnO thin films.

ADDITIONAL FESEM CHARACTERIZATION

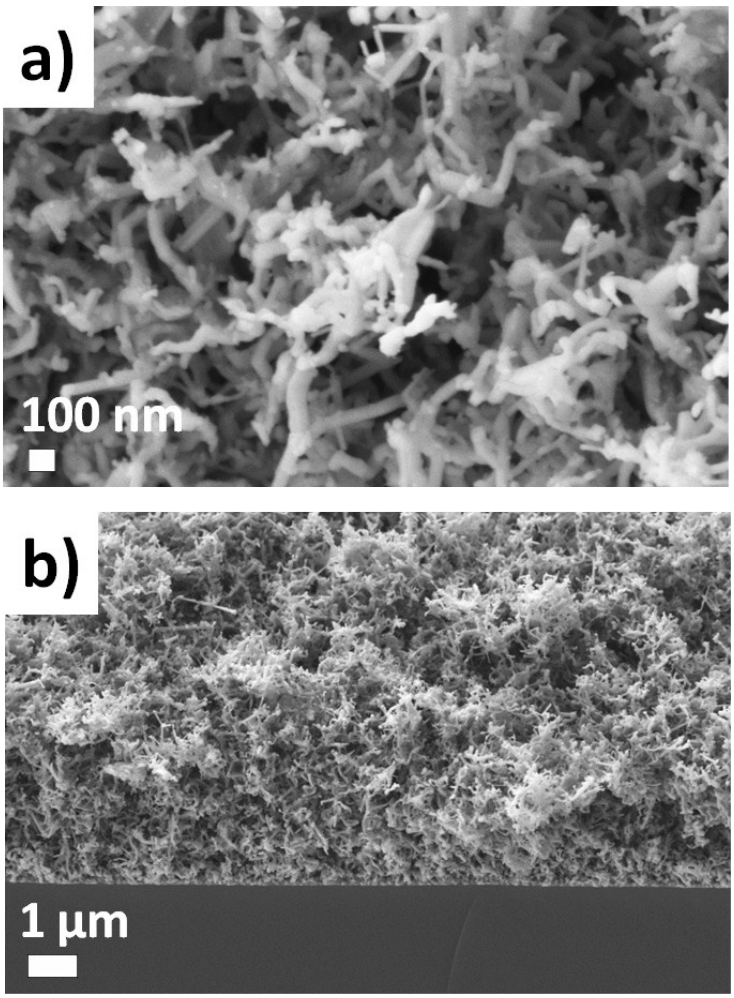

Figure S2. FESEM images showing (a) the surface morphology and (b) cross-section nanostructure of sputtered Zn layers.

XPS CHARACTERIZATION

An initial qualitative analysis of the chemical elements present on the surface of both the compact and nanobranched samples was obtained by the acquisition of survey spectra (panels a and c of Figure S3). The detected elements were Zn, O and C (which can be related to unavoidable surface contamination by hydrocarbons in all air-exposed samples). In order to reduce the adventitious carbon contamination, both samples were subjected to a cleaning process through Ar^+ ion bombardment (1 min at 2 kV acceleration voltage). Concerning the compact sample, the cleaning process was successful in eliminating almost all the surface contamination (panel b of Figure S3), while in the case of the nanobranched sample it was not possible to dismiss completely the hydrocarbon contamination, due to the nanoporous structure of the sample (panel d of Figure S3).

The high resolution spectra reported in the main manuscript (Figure 3) have been acquired after the afore-mentioned cleaning process, in order to maximize the information provided by the sample.

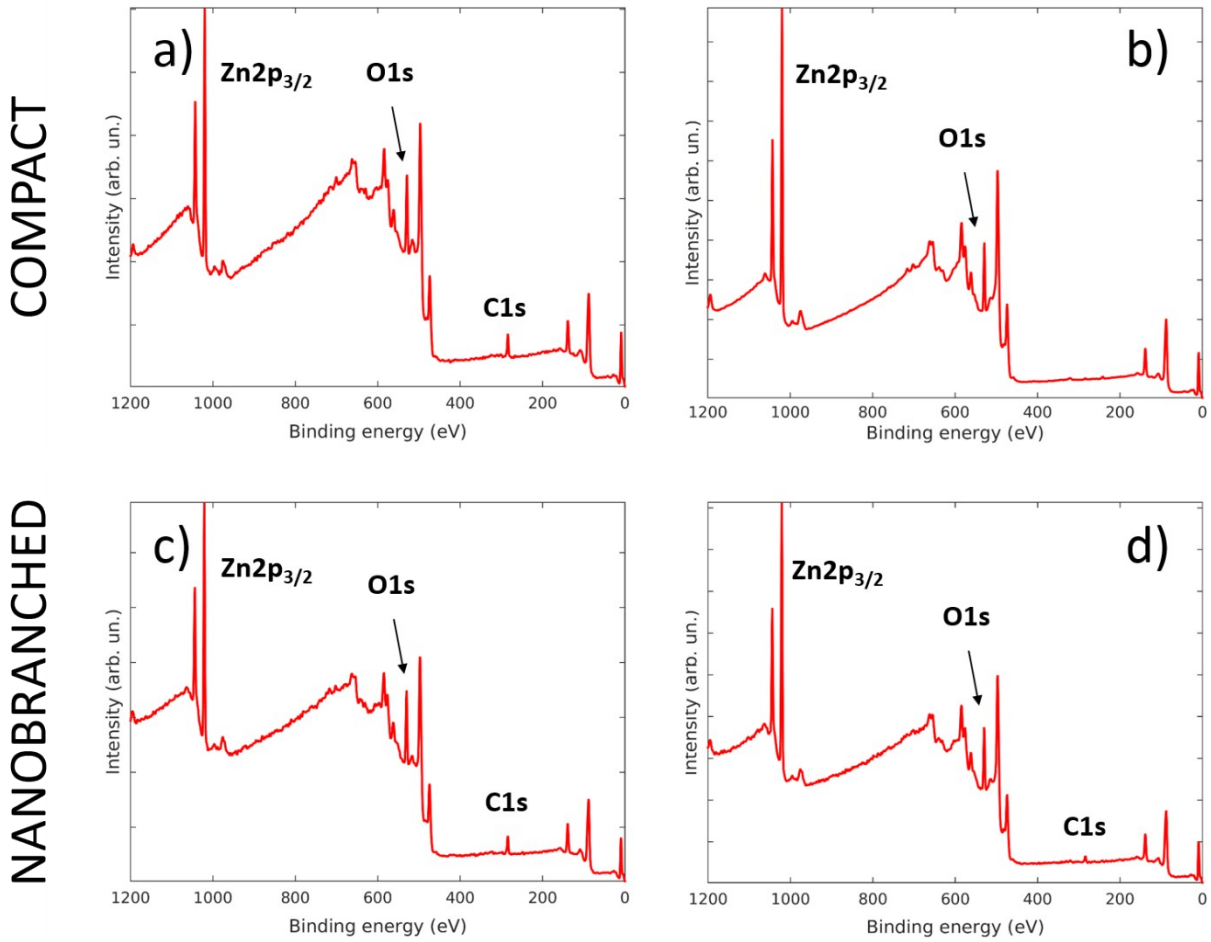

Figure S3. XPS survey spectra for the compact (a-b) and the nanobranched (c-d) ZnO samples. Spectra on the left side were acquired before the cleaning process, while spectra on the right were taken after cleaning.

XRD CHARACTERIZATION

Table S1. XRD peaks positions detected for nanobranched ZnO thin films and the corresponding texture coefficients (*TC*).

Peak position	(hkl) crystal plane	*TC* (hkl)
31.85°	(100)	0.83
34.50°	(002)	1.75
36.30°	(101)	0.88
47.65°	(102)	0.63