

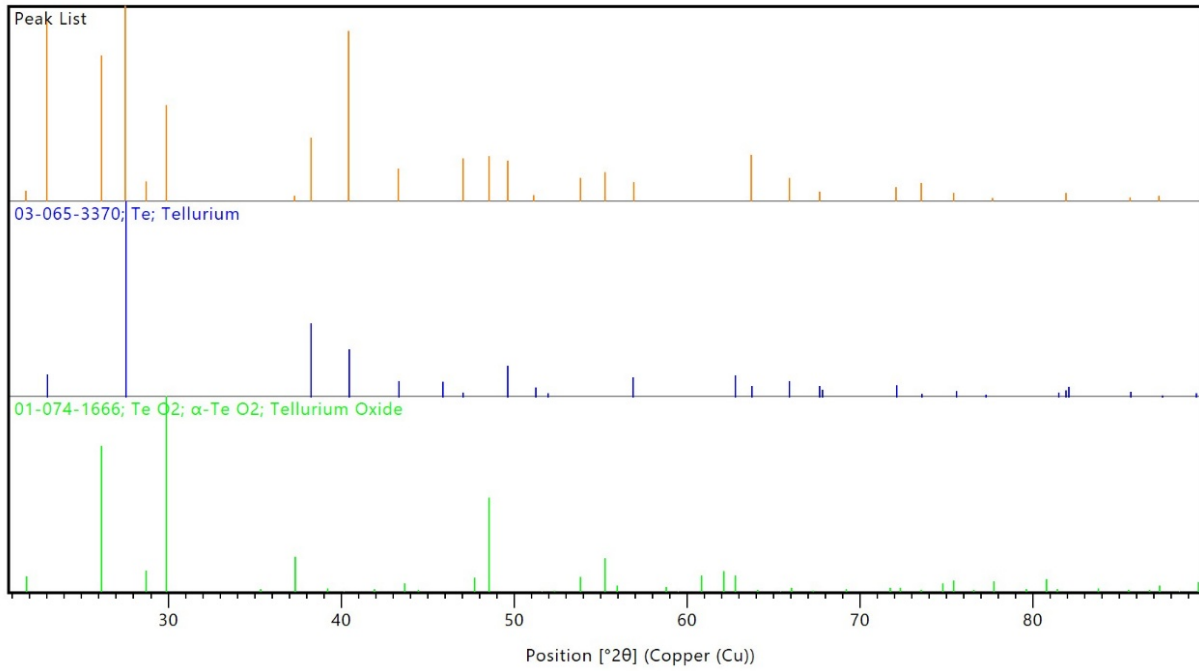
**Figure S1.** XRD peak comparison between synthesized ZnO nanorods and standard reference patterns (PDF 01-086-8923 and 01-080-7099).

**Table S1.** Comparison of experimental XRD reflections of ZnO nanorods with PDF reference: : 01-086-923 (ZnO, wurtzite)

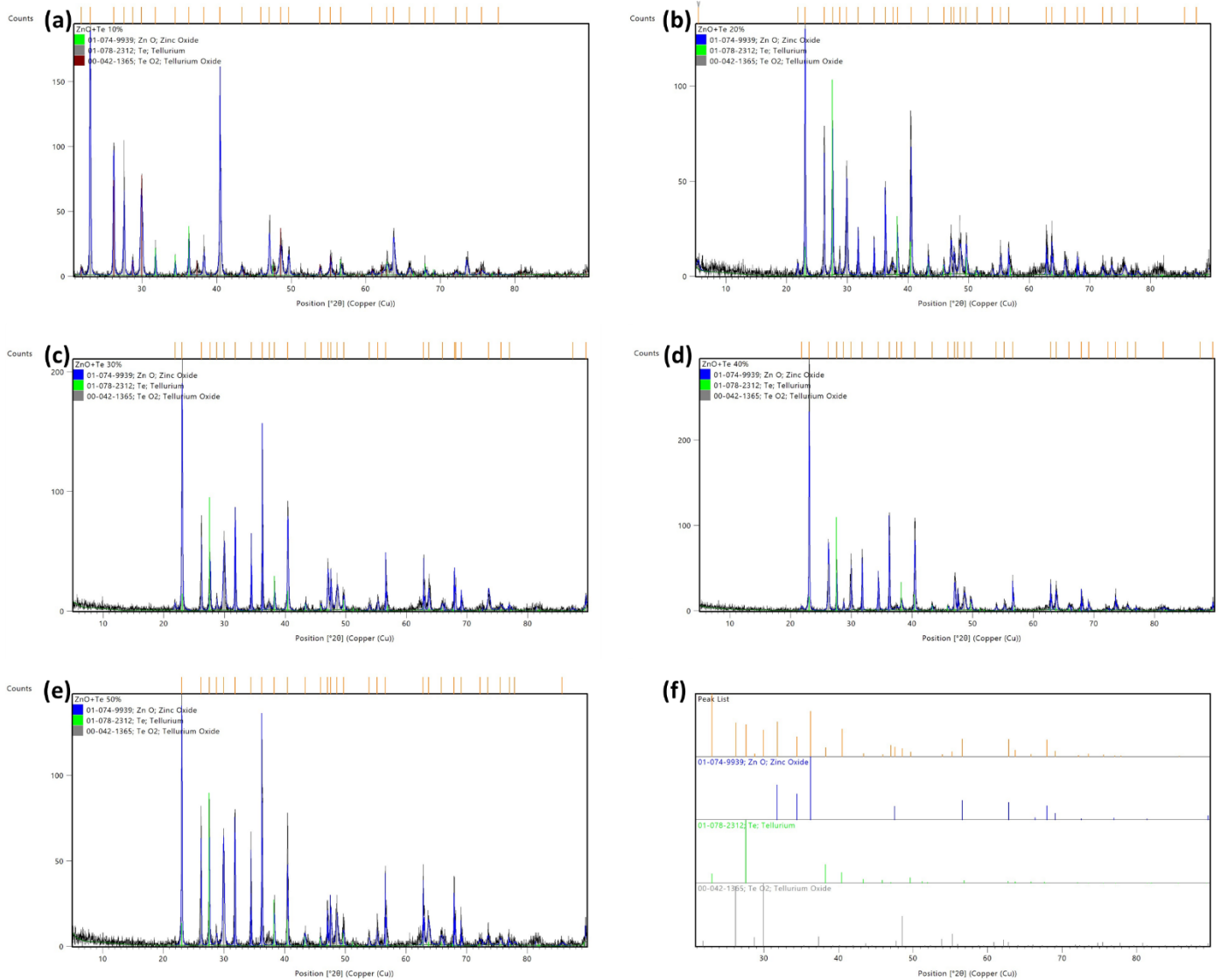
Plane (hkl)	2θ (PDF) (°)	d (PDF) (Å)	2θ (Exp.) (°)	d (Exp.) (Å)	Δ2θ (°)
(100)	31.868	2.8059	31.86	2.807	-0.01
(002)	34.536	2.5950	34.52	2.598	-0.02
(101)	36.369	2.4683	36.36	2.471	-0.01
(102)	47.698	1.9052	47.69	1.907	-0.01
(110)	56.783	1.6200	56.77	1.622	-0.01
(103)	63.079	1.4726	63.06	1.475	-0.02
(200)	66.604	1.4030	66.59	1.405	-0.01
(112)	68.187	1.3742	68.17	1.376	-0.02
(201)	69.327	1.3544	69.31	1.356	-0.02
(004)	72.837	1.2975	72.82	1.299	-0.02

**Table S2.**TC results (using 6 main reflections) of ZnO nanorods

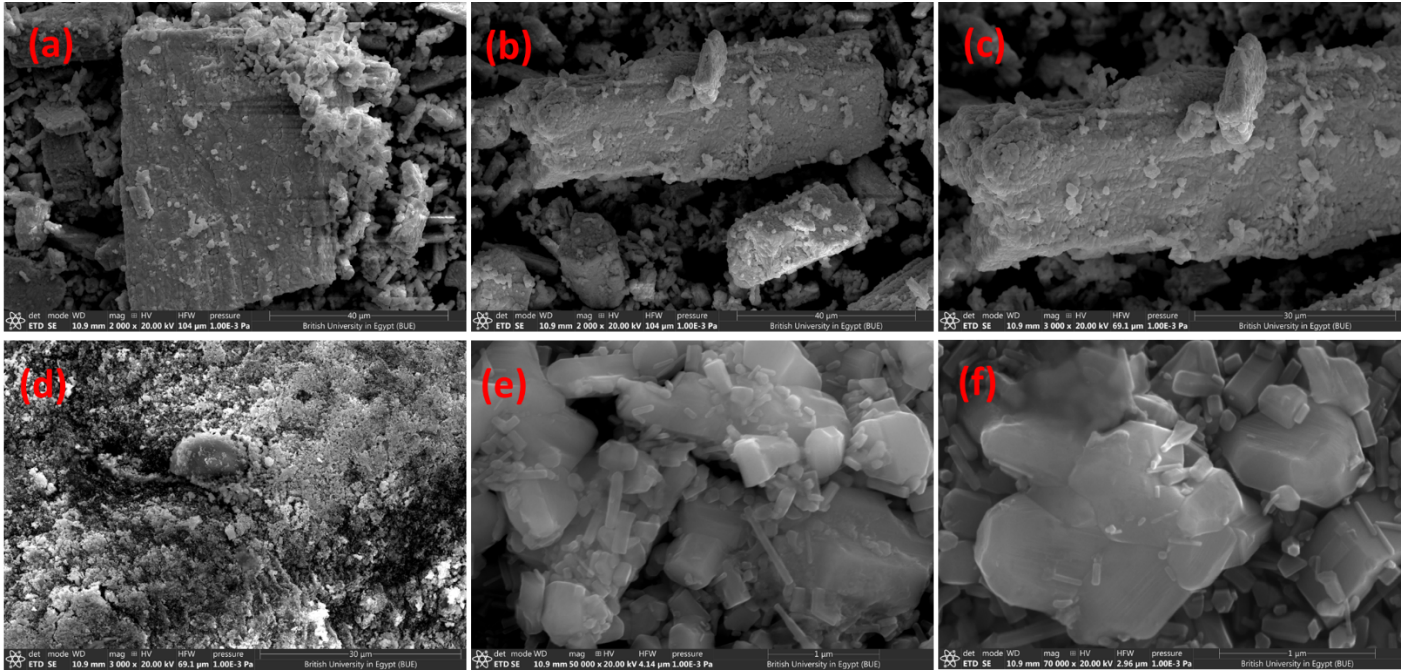
(hkl)	I <sub>0</sub> (PDF ref.: 01-086-923) (%)	TC
(100)	56.0	<b>1.11</b>
(002)	41.0	<b>0.61</b>
(101)	100.0	<b>0.60</b>
(102)	21.2	<b>1.66</b>
(110)	29.7	<b>1.02</b>
(103)	25.8	<b>1.00</b>



**Figure S2.** XRD peak line comparison between synthesized TeO<sub>2</sub>/Te nanosheets peak list (orange) and standard reference patterns Te (PDF 01-078-2312) and TeO<sub>2</sub> (PDF 01-080-7099) reference cards.



**Figure S3.** XRD peak matching of the ZnO-decorated Te/ $\alpha$ -TeO<sub>2</sub> nanosheets at different ZnO loadings: (a) Z2 (10% ZnO/TeO<sub>2</sub>/Te), (b) Z3 (20% ZnO/TeO<sub>2</sub>/Te), (c) Z4 (30% ZnO/TeO<sub>2</sub>/Te), (d) Z5 (40% ZnO/TeO<sub>2</sub>/Te), and (e) Z6 (50% ZnO/TeO<sub>2</sub>/Te), showing the evolution of characteristic ZnO, Te, and  $\alpha$ -TeO<sub>2</sub> reflections with increasing ZnO content. Panel (f) compares the experimental XRD peak positions of the Te/ $\alpha$ -TeO<sub>2</sub> nanosheets with the corresponding standard PDF reference patterns, confirming accurate phase assignment and crystallographic consistency.



**Fig. S4.** FE-SEM images of the raw materials: Te (a–c) and ZnO (d–f) at different magnifications.