Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C

Doping by diffusion of dopants from the substrate:synthesis of doped ZnO nanowires

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Table S1: Radii of different elements

s. no	Elements	Empirical radius (A)	Covalent radius (A)
1.	Zn	135	131
2.	O	60	73
3.	N	65	75
4.	P	100	106
5.	As	115	119
6.	C	70	77
7.	Ga	130	126
8.	In	155	144
9.	Al	125	118
10.	K	220	196
11.	Na	180	154
12.	Li	145	134
13.	Sb	145	138
14.	Cu	135	138
15.	Ag	160	153

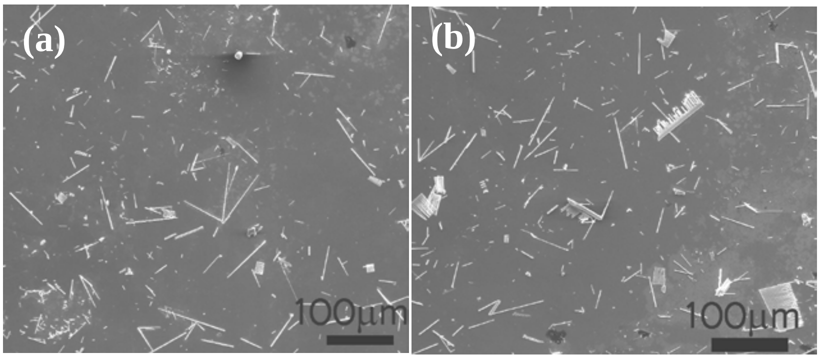

FIG. S1. (a) & (b) SEM images of nanowires on SiO_2 substrates.

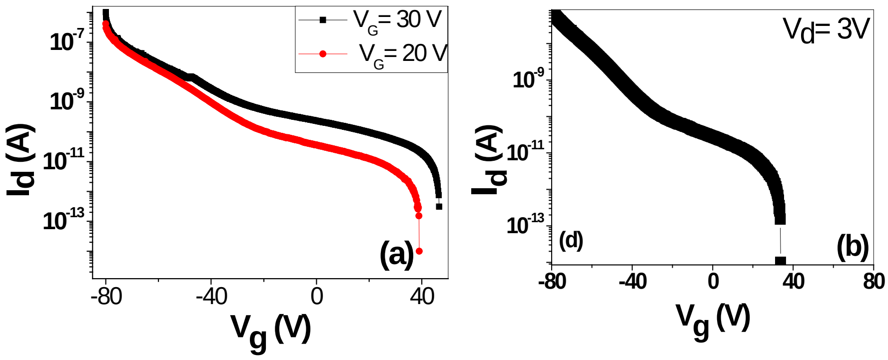

FIG. S2.(a) FET characteristics of another device (b) Measurements done after eight months.

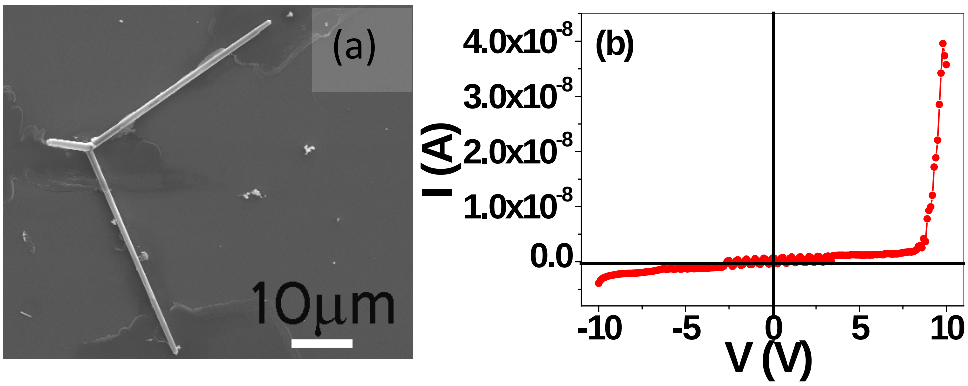

FIG. S3. (a) SEM image of a ZnO homojunction, and (b) I-V characteristic of the homojunction.

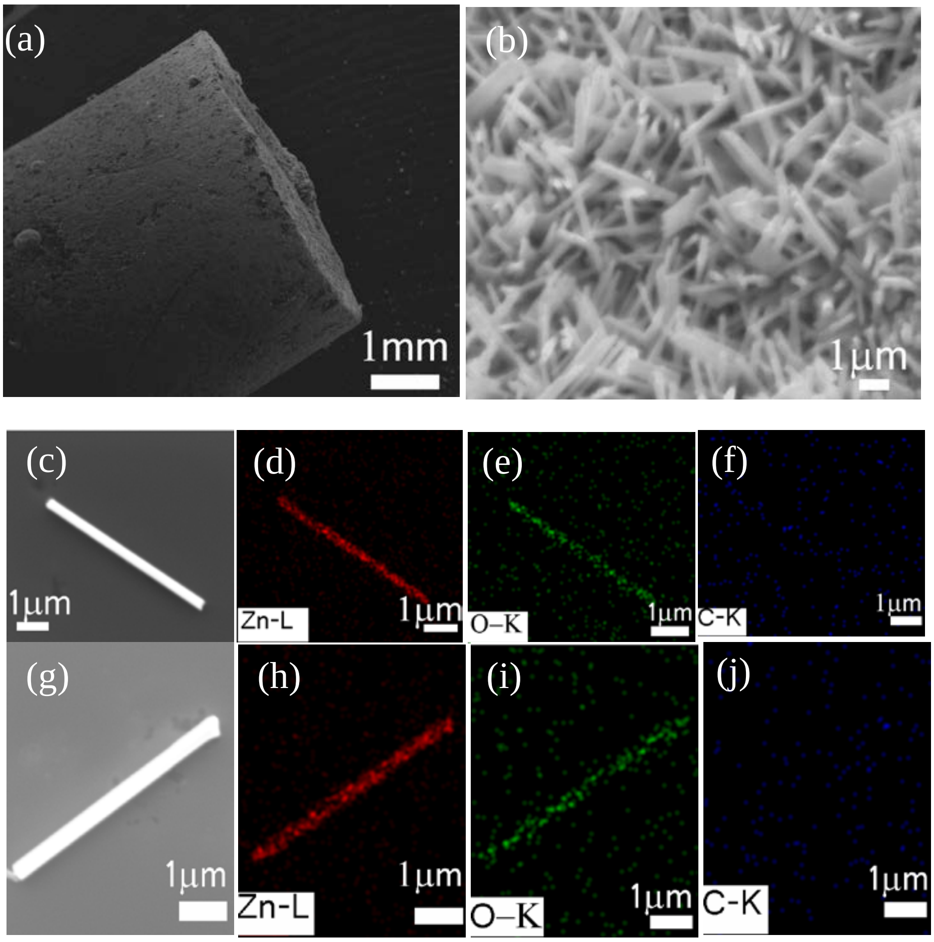

Fig S4 (a) low & (b) high mag images of ZnO nanowires on graphite rod. (c-f) and (g-j) SEM images and elemental mapping of ZnO nanowires grown on a graphite rod.

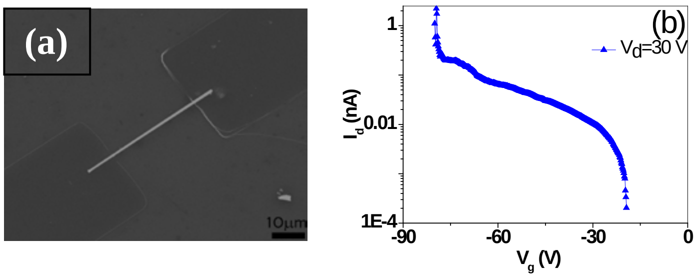

FIG S5. (a) SEM image of the FET structures Na-doped ZnO nanowire. (b) FET characteristics of Na doped nanowire.

Preparation of FET structures

The bundles are transferred to the vial containing Isopropyl alcohol solution and rigorously sonicated during which the ZnO nanorods separate out from the bundles. Few drops of solution are drop casted on to the Si substrate with SiO_2 layer to obtain dispersed nanorods. Branched ZnO are also dispersed on Si substrate with SiO_2 layer using similar procedure. Since after rigorous sonication the branched structures of the nanorods were broken, the contacts were taken from the single branch and backbone structures.

Method for mobility calculation

Carrier mobility was calculated with FET model for metal oxide semiconductors given by[1]

$$I_{DS} = (W/2L).\ \mu C_i\ (V_G-V_T)^2$$

where W and L are the width and length of the channel, respectively, μ is the carrier mobility which can be extracted from the saturation region of the transfer curves, V_G is gate voltage, V_T is threshold voltage and C_i is the capacitance per unit area. The carrier concentration is calculated using the relation

$$\sigma = ne\mu$$

where σ is the conductivity, n is the carrier density, e is the charge and μ is the carrier mobility.

1. B. N. Pal, B. M. Dhar, K. C. See, H. E. Katz, Nature Materials, 2009, 8, 898-903.