Appendix. Supplementary data

1. Synthesis of dyes D2 and D3

1,3-bis[4-(1-methyl-2-quinolinylidene-methyl) quinolinium]-2-propanol diiodide (**D2**): A mixture of 1,3-bis(4-methylquinolinium)-2-propanol dichloride (0.60 g,1.4 mmol) and 1-methyl-2-methylthioquinolinium iodide (1.00 g, 3.2 mmol) was dissolved in anhydrous ethanol under reflux, and a few drops of triethylamine were added as a catalyst. The reaction mixtures were refluxed for 4 h. After cooling, the resulting precipitate was filtered off and purified by recrystallization from EtOH, to give pure green solid 0.54g. Yield: 44%, m.p:210-211℃. UV-Vis (MeOH) λ_{max}: 558.0 nm, ε: 1.02×10^5 L·mol^{-1} cm^{-1}. ^{1}H NMR (400 MHz, DMSO-d_6) δ (ppm): 4.03 (s, 6H, -NCH_3), 4.29 (s, 1H, -OH), 4.34-4.50 (m, 2H, -NCH_2), 5.04 (d, *J*=13.7 Hz, 2H, -NCH_2), 5.68-5.76 (m, 1H, -CH-), 6.53 (s, 2H ,-CH=), 7.41 (d, *J*=7.2 Hz, 2H, ArH), 7.53 (t, *J*=7.5 Hz, 2H, ArH), 7.65 (t, *J*=7.5 Hz, 2H, ArH), 7.82 (t, *J*=7.6 Hz, 2H, ArH), 7.94 (t, *J*=7.6 Hz, 2H, ArH), 7.97-8.02 (m, 5H, ArH), 8.08-8.15 (m, 5H, ArH), 8.28 (d, *J*=8.4 Hz, 2H, ArH), 8.56 (d, *J*=8.4 Hz, 2H, ArH). IR (KBr) υ: 3440 (s, υ_{O-H}), 2920, 2855 (w, υ_{C-H}), 1598, 1500 (s, $\upsilon_{C=C}$, $\upsilon_{C=N}$), 1318 (s, υ_{C-O}), 1210, 1144, 1045 (s, υ_{C-N}, δ_{C-H}), 731 (s, $\delta_{=C-H}$) cm^{-1}. HRMS (TOF MS ES-) calculated for $C_{43}H_{38}N_4O^{2+}$: 313.1517; found: 313.1536.

1,3-bis[4-(2-benzo[c, d]indolylidene-methyl) quinolinium]-2-propanol diiodide (**D3**): A mixture of 1,3-bis(4-methylquinolinium)-2-propanol dichloride (0.33 g, 0.8 mmol) and 2-methylthiobenzo[c,d]indolium iodide (0.58 g, 1.8 mmol) was dissolved in anhydrous ethanol under reflux, and a few drops of triethylamine were added as a catalyst. The reaction mixtures were refluxed for 6 h. After cooling, the resulting precipitate was filtered off and purified by recrystallization from EtOH, to give pure violet black solid 0.41 g. Yield: 57%, m.p:256-257℃. UV-Vis (MeOH) λ_{max}: 591.0 nm, ε: 1.07×10^5 L·mol^{-1} cm^{-1}. ^{1}H NMR (400 MHz, DMSO-d_6) δ (ppm): 3.85-3.95 (m, 4H, -NCH_2), 4.17 (s, 1H, -OH), 4.55-4.61 (m, 1H, -CH-), 5.97 (s, 2H, -CH=), 7.30 (d, *J*=6.5 Hz, 2H, ArH), 7.54-7.61 (m, 4H, ArH), 7.81-7.87 (m, 4H, ArH), 8.05-8.11 (m, 4H, ArH), 8.20 (d, *J*=6.9 Hz, 2H, ArH), 8.32 (d,

J=8.5 Hz, 2H, ArH), 8.66 (d, *J*=7.2 Hz, 2H, ArH), 8.78 (d, *J*=6.9 Hz, 2H, ArH), 8.99 (d, *J*=8.5 Hz, 2H, ArH). IR (KBr) υ: 3440 (s, υ_{O-H}), 3242(w, $\upsilon_{=N-H}$), 1532 (s, $\upsilon_{C=C}$, $\upsilon_{C=N}$), 1301 (s, υ_{C-O}), 1219, 1161, 1069 (s, υ_{C-N}, δ_{C-H}), 813, 756 (s, $\delta_{=C-H}$) cm-1. HRMS (TOF MS ES-) calculated for $C_{45}H_{34}N_4O^{2+}$: 323.1361; found: 323.1429.

2. The absorption spectra of dyes D1, D2 and D3

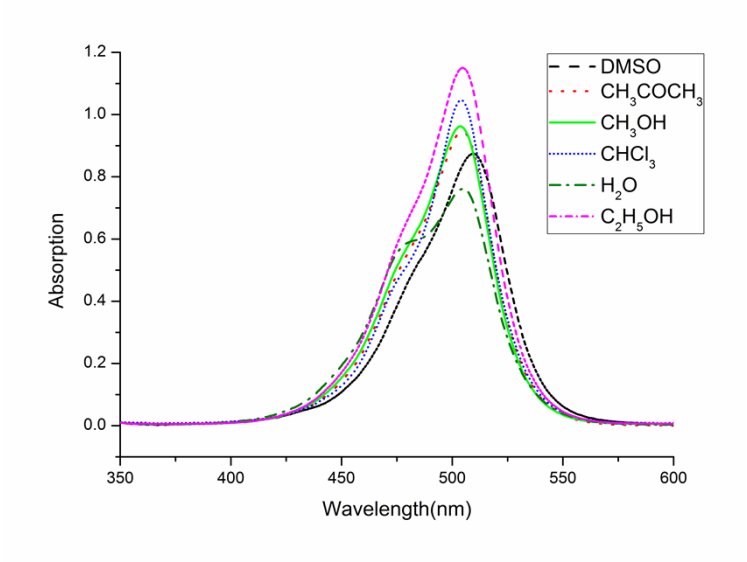

Fig. S1 Absorption spectra of dye **D1** in different solvents

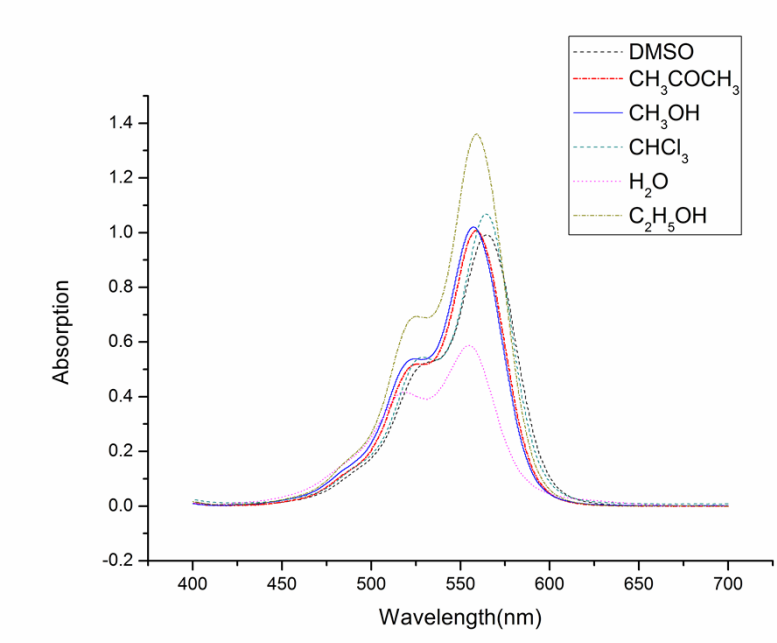

Fig. S2 Absorption spectra of dye **D2** in different solvents

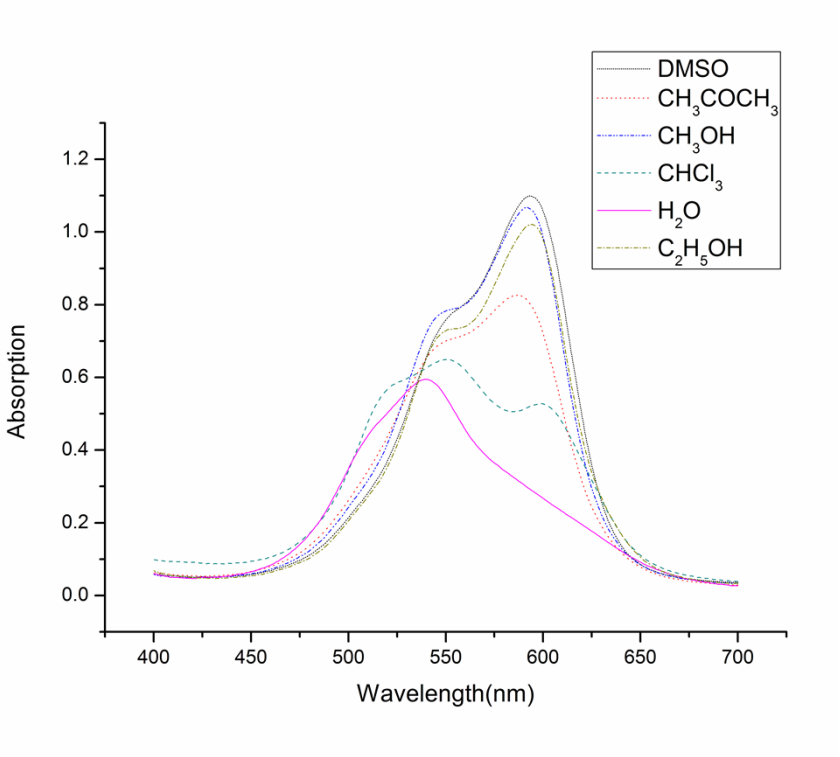

Fig. S3 Absorption spectra of dye **D3** in different solvents

3. The X-ray photoelectron spectroscopy of Si/D2 and Si/D3

The C_{1s}, O_{1s} and N_{1s} spectra of Si/**D2** and Si/**D3** were showed in Fig. S4-S11.

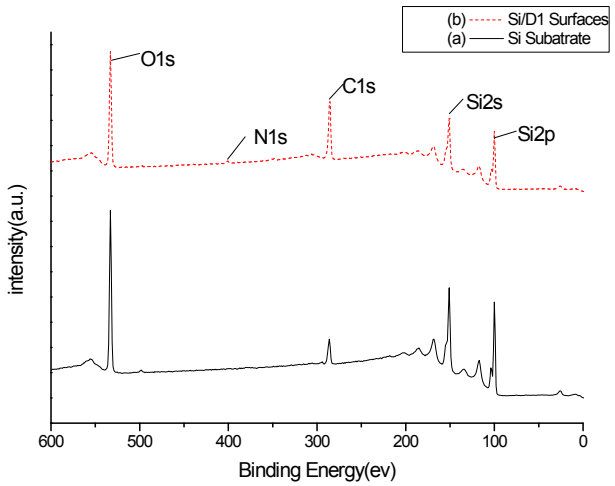

Fig. S4. The XPS scan spectra of Si substrate (a) and Si/**D2** (b) surfaces

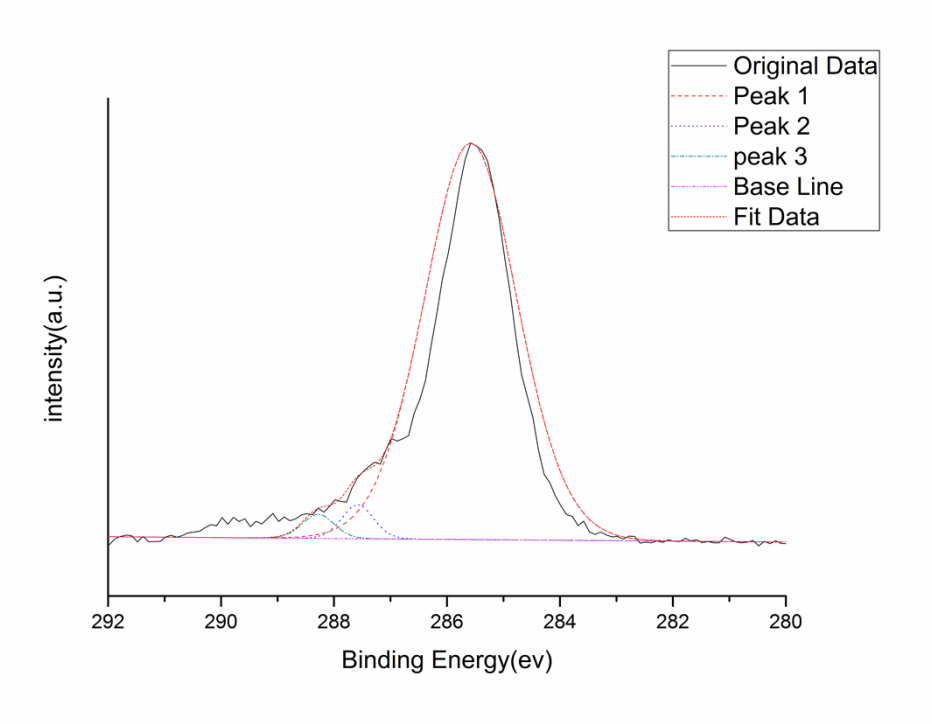

Fig. S5. The C_{1s} spectra of Si/**D2** surface

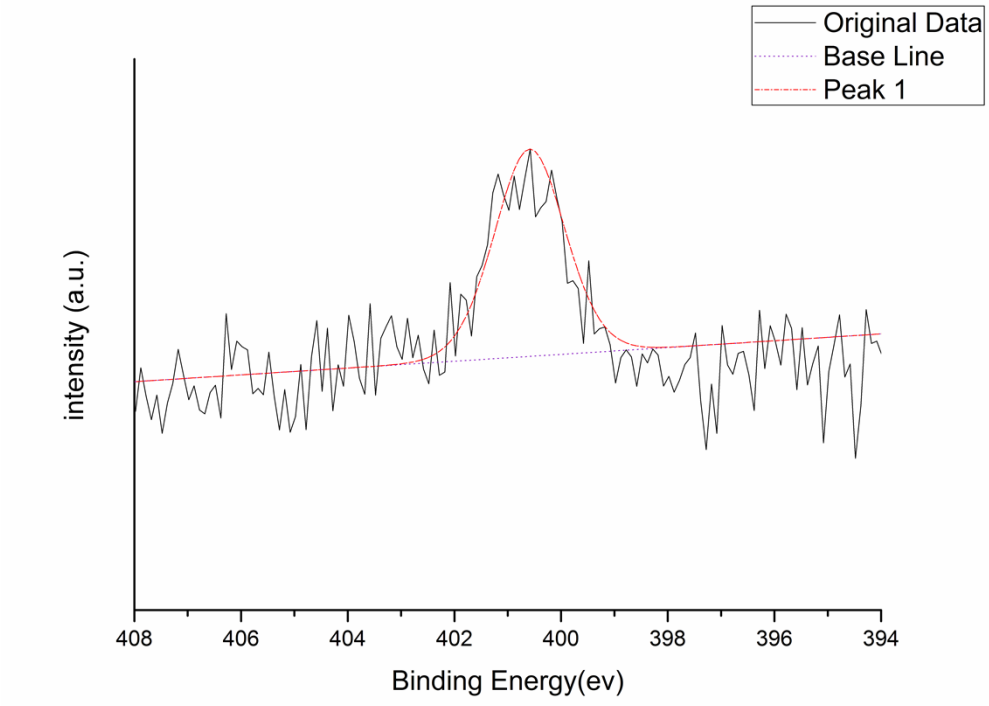

Fig. S6. The N_{1s} spectra of Si/**D2** surface

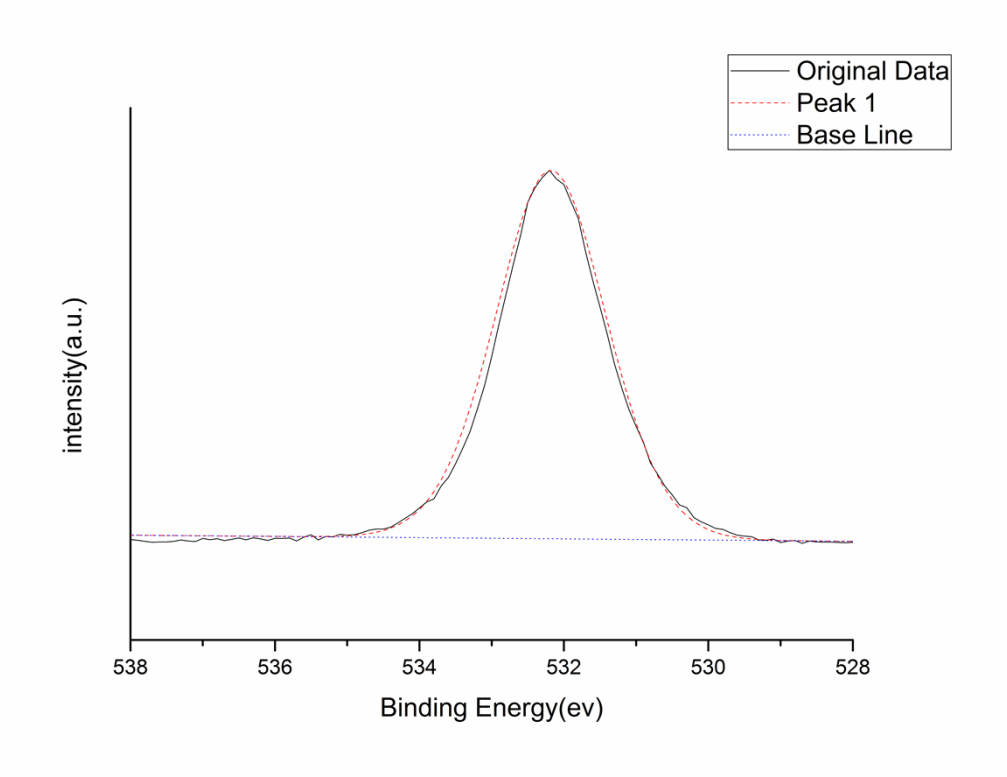

Fig. S7. The O_{1s} spectra of Si/**D2** surface

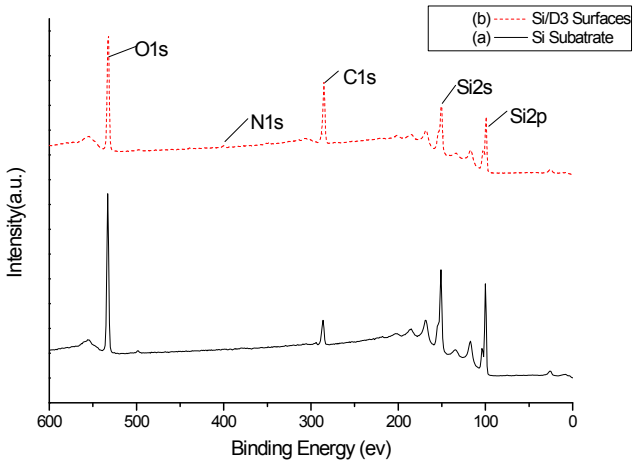

Fig. S8. The XPS scan spectra of Si/**D3**

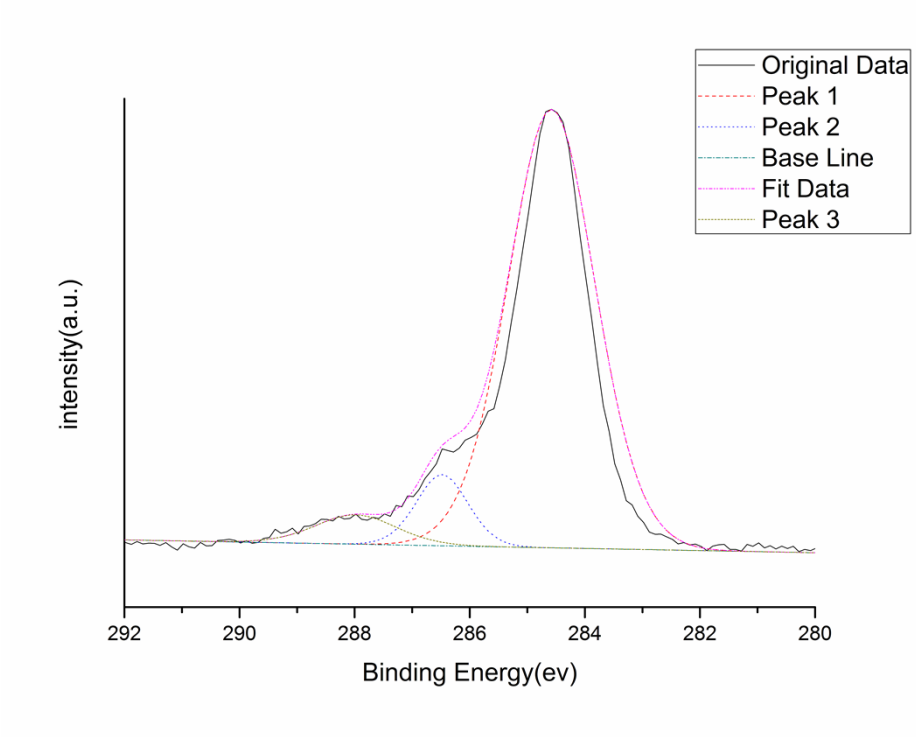

Fig. S9. The C_{1s} spectra of Si/**D3** surface

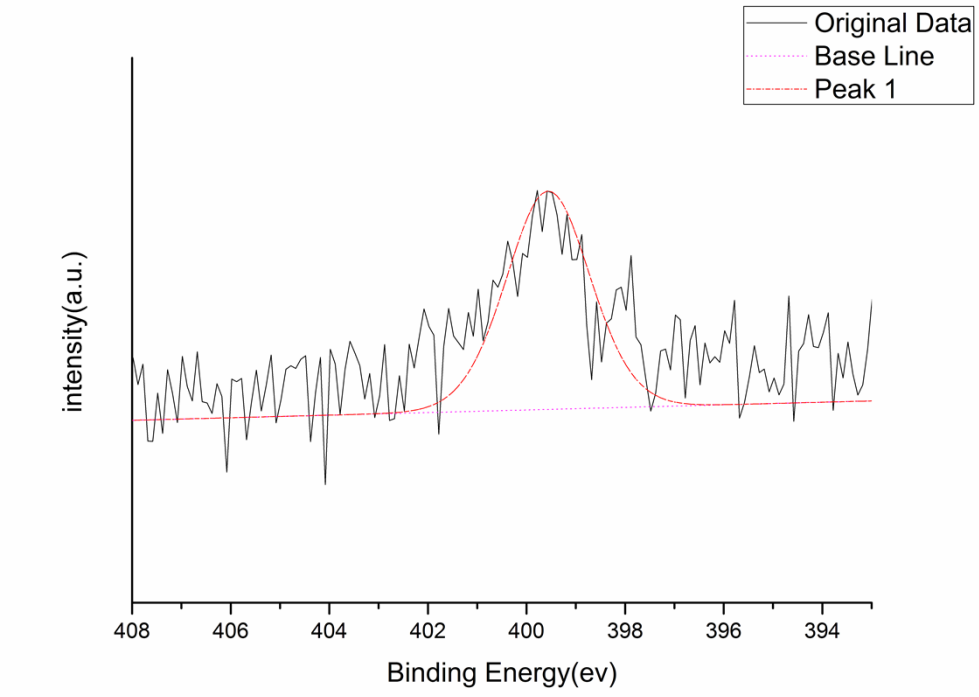

Fig. S10. The N_{1s} spectra of Si/**D3** surface

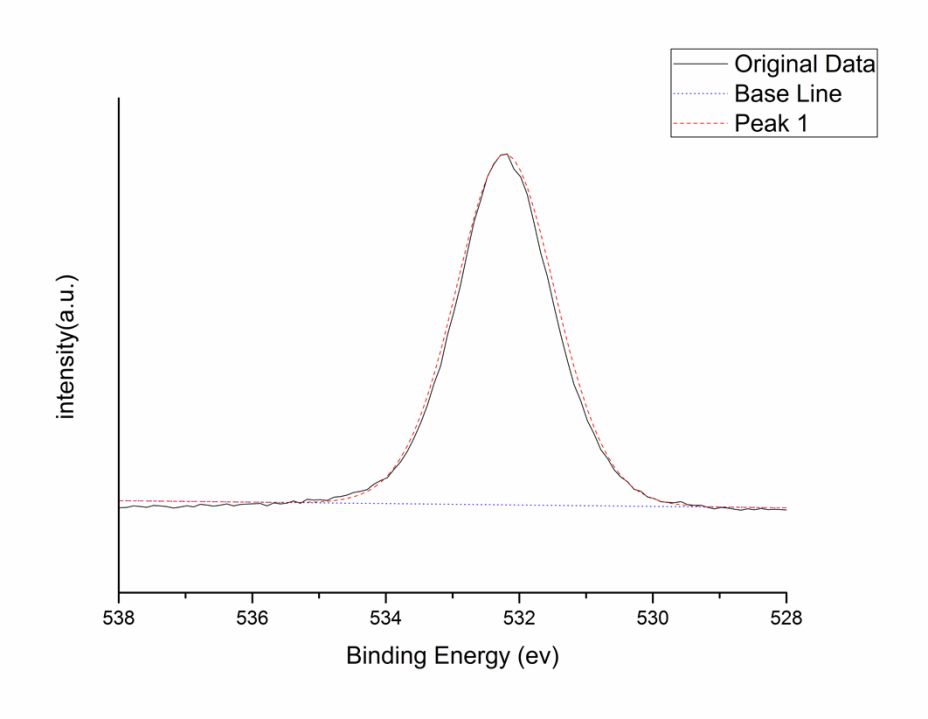

Fig. S11. The O_{1s} spectra of Si/**D3** surface

4. 2D and 3D AFM images of Si substrate, Si/D2 and Si/D3

Fig. S12 and S13 showed two-dimensional and three-dimensional surface topography images of Si/**D2** and Si/**D3**.

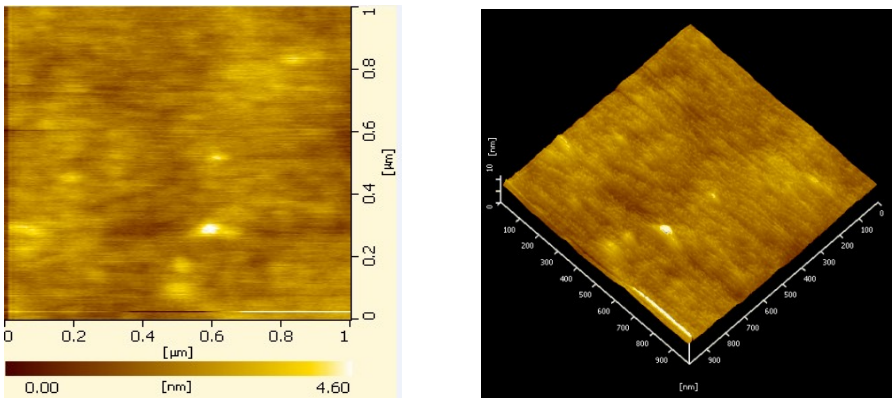

Fig. S12. 2D and 3D AFM images of Si/**D2**

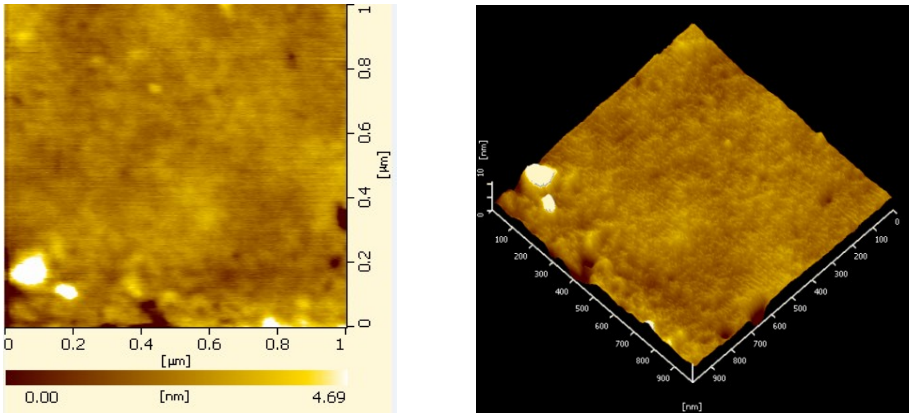

Fig. S13. 2D and 3D AFM images of Si/**D3**