Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Table S1

Composition of stainless steels (wt.%)

C	Cr	Mn	Ni	Si	Mo	S	P	N	Fe
0.03	16.3	1.2	10.0	0.42	2.4	0.025	0.03	0.06	Bal.

Experimental Details

Samples of 10 mm × 10 mm size were cut from them and abraded successively with series of emery papers 400-600–800–1000–1200 grades. The surface was then mirror polished using alumina of 0.3 μm and etched using aquaregia until grain boundaries were revealed to observe the changes in the microstructure due to CD. To identify the phases present after deformation, XRD of the annealed and deformed samples were also carried out using DX-2700 (Dandong Haoyuan Instrument Co. Ltd., China) X-ray diffractometer. Specimens with surface of 10 mm × 10 mm with original thickness were also used for electrochemical measurements and surface analysis. The exposed surfaces of all samples were mirror polished as discussed above before corrosion tests. BSA for the present study was obtained from Regal Biotech Co. China.

The electrochemical experiments were carried out by means of a standard three-electrode cell assembly. Autolab PGSTAT302N was used for polarization studies in which platinum wire and dip-type saturated calomel electrode (SCE) were used as the counter and reference electrodes, respectively and CHI900C scanning electron microscope was used for SECM. Potentiodynamic polarization curves were attained by changing the electrode potential from -1.2 to 2 V versus open circuit potential (E_{OC}) at a scan rate of 0.01 V s^{-1}. The potential of the working electrode was measured against that of the saturated calomel electrode (SCE). SECM maps were recorded by scanning the Pt tip over the sample surface in an x–y plane, set at a vertical tip–substrate distance of 200 μm with Ag/AgCl reference electrode. The sample (working electrode) was kept in the test

solution at 37 ºC for 2 h, prior to the different experiments. The temperature of the cell was maintained at the experimental temperature. All the measurements were repeated no less than three times, and a fresh solution was used for each new test. SEM (ZEISS EVO MA15) and AFM (Keysight Tech. 7500, USA) were used to explore the surface morphology of steel samples after polarization tests. XPS (Model: XSAM 800, Japan) was used to detect the chemical compositions of the passive films formed on the working electrodes after 2 h of immersion in solution containing BSA and without BSA. Fourier transform infrared spectroscopy (FTIR) (Model: WQF-520, China) was also performed of stainless steel surface after 2 h immersion in solution containing BSA to further confirm the adsorption of BSA on steel surface.

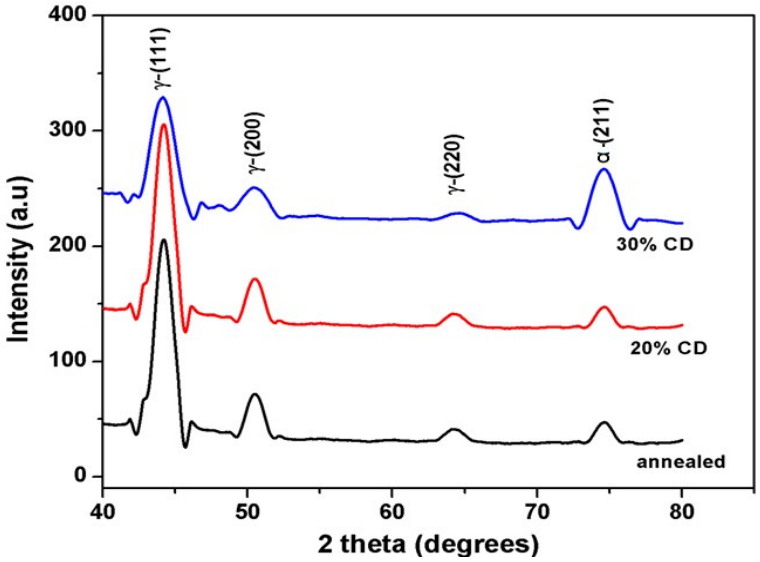

Fig. S1:XRD patterns of annealed and cold deformed SS samples

Table S2

Polarization parameters for SSs in PBS solution at 37˚C in absence and in presence of BSA

CD (%)	E_{corr} (V vs SCE)	i_{corr} (μAcm^{-2})	β_c (mV dec^{-1})	β_a (mV dec^{-1})	Corrosionrate (mmy^{-1})	E_{bd} (V)	Polarization Resistance (kΩ cm^2)
Absence of BSA							
0	-0.575	5.16	238	325	0.050	0.24	13.20
10	-0.609	3.84	212	183	0.035	0.537	14.01
20	-0.541	3.64	180	137	0.030	0.545	14.97
30	-0.647	5.42	258	226	0.053	0.402	12.87
Presence of BSA							
0	-0.503	3.93	304	269	0.046	0.30	13.63
10	-0.587	3.23	174	162	0.027	0.50	16.67
20	-0.682	2.54	193	145	0.022	0.60	19.23
30	-0.609	3.61	245	225	0.030	0.51	15.50

*CD= cold deformation, E_{corr}= corrosion potential, i_{corr} = corrosion current, β_c& β_a= cathodic& anodic slope, E_{bd} = breakdown potential

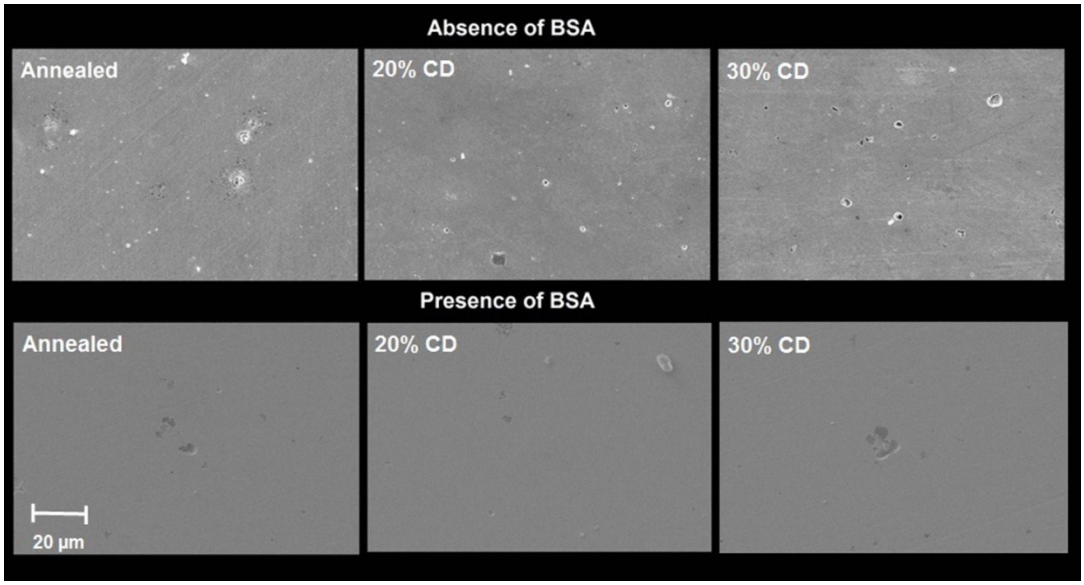

Fig.S2. SEM micrographs after polarization tests

Table S3

AFM scan parameters for different SSs surfaces after polarization tests in absence and presence of BSA

CD (%)	R_a (nm)	S_p(nm)	S_v(nm)	S_z(nm)
Absence of BSA				
0	13.7	67.4	31.6	99.0
20	11.3	69.3	30.2	99.4
30	14.4	88.5	49.9	128
Presence of BSA				
0	8.27	48.8	45.6	94.3
20	7.03	31.9	29.1	61.0
30	8.15	45.8	34.0	79.7

R_a = average roughness, S_p = max peak height, S_v= max pit height, S_z= max height

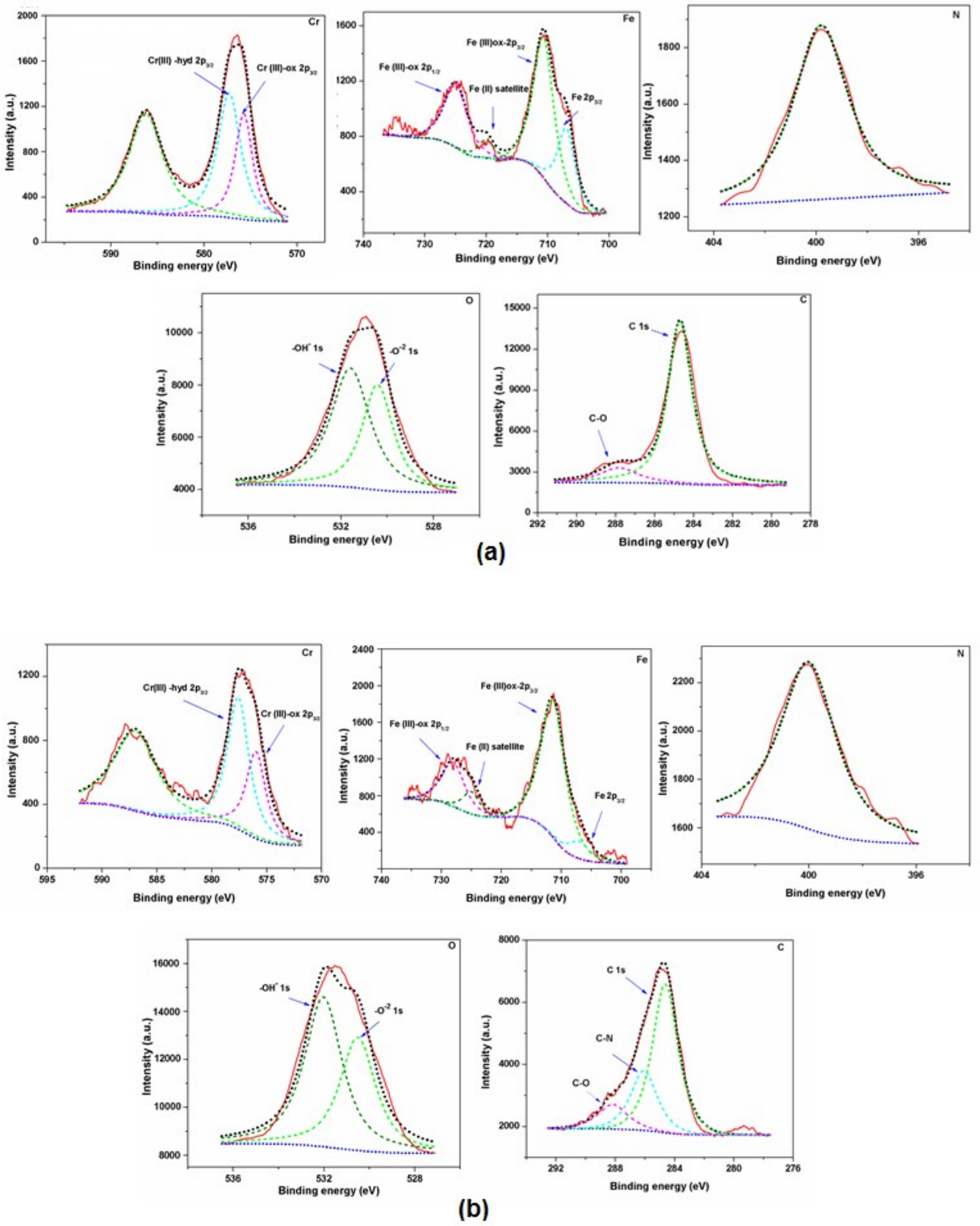

Fig.S3. X-ray photoelectron spectra recorded for passive films of the 316L SSs exposed to PBS solution; (a) absence of BSA (b) presence of BSA

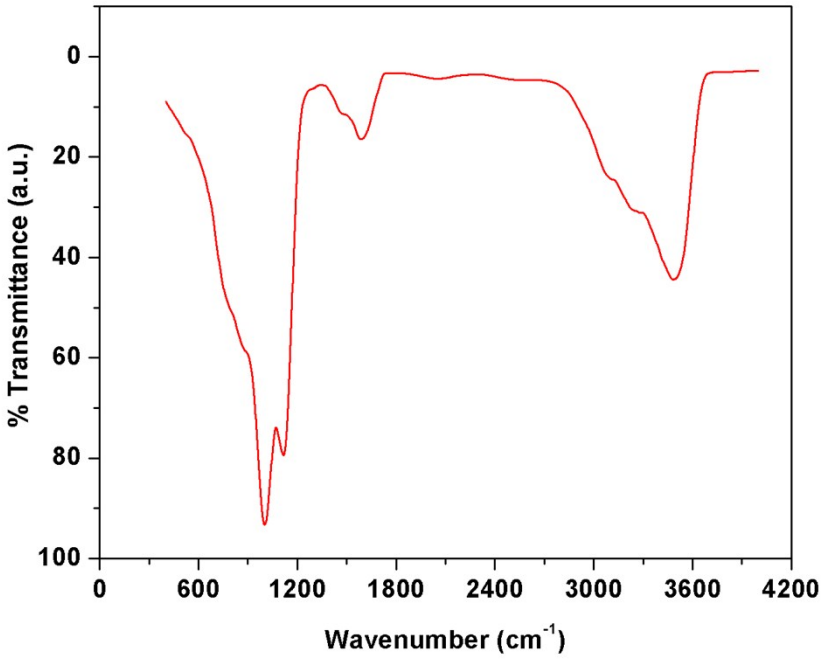

Fig.S4. FTIR spectrum of BSA absorbed onto the surface of SS coupon