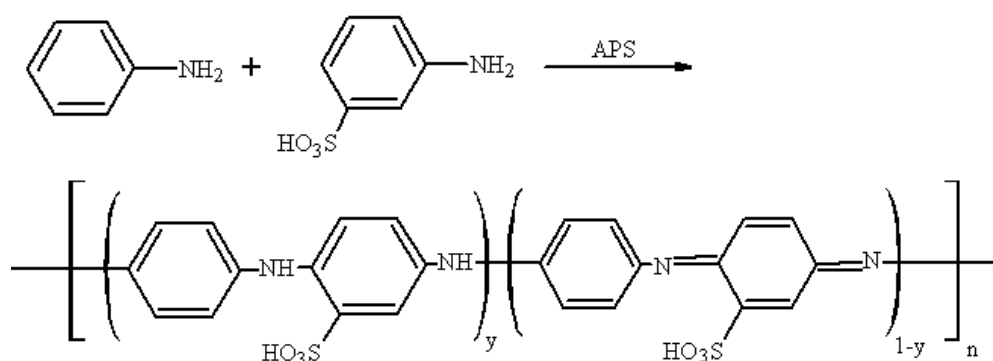


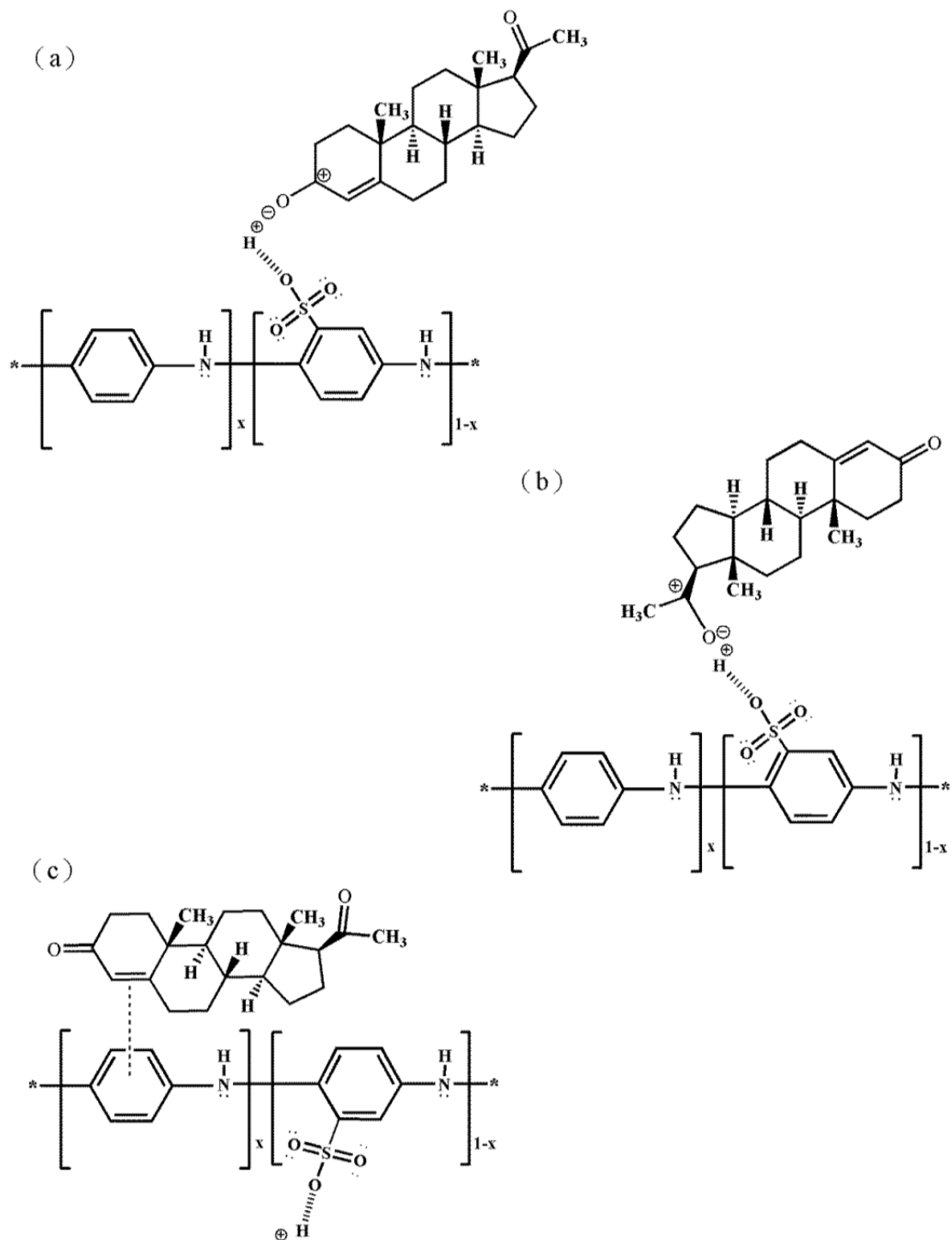
Supplementary information:

The possible mechanisms of both co-polymerization process, and the interaction of progesterone with imprinted poly(aniline-co-metanilic acid)

The general formula of ideal polyaniline materials in their base forms consists of benzenoid and quinoid units. Poly(aniline-co-metanilic acid) also has a similar chemical structure with staggered arrangement of aniline and metanilic units. The γ value accounts for the oxidation state of the polymer chains. Leucoemeraldine base, emeraldine base, and pernigraniline base correspond to the completely reduced ($\gamma=1$), half oxidized ($\gamma=0.5$), and completely oxidized ($\gamma=0$) states, respectively. Base is protonated by sulfonic acid leading to the corresponding salts, and emeraldine salt exhibits the high electric conductivity.



Scheme S1. The mechanism of co-polymerization process of the Poly(aniline-co-metanilic acid).



Scheme 2. Three possible recognition mechanisms of the progesterone to the molecularly imprinted poly(aniline-*co*-methanilic acid), including hydrogen bonding ((a) and (b)) and hydrophobic interaction (c).

Detailed explanation of electron transfer between the electrochemical probe and electrode

Typical CVs corresponding to the co-polymerization of ANI and MSAN are depicted in Fig. S1(a). Two major redox couples are observed in these CVs, where the electrode potential was continuously swept between -200 and 800 mV at a scan rate of 50 mV s^{-1} . In the positive sweep (refer to 15th cycle), the first redox peak extending from 100 to 400 mV centered at ca. 300 mV is well known as the formation of radical cations (polaronic emeraldine)¹; and the second redox couple commencing at ca. 670 – 800 mV is the formation of diradical dications (the resonance structures: bipolaronic pernigraniline and protonated quinonediimine)¹ through the oxidation of poly(ANI-*co*-MSAN) film deposited on the electrode (Fig. S1(b)). On the other hand, a representative CV corresponding to the $\text{Fe}^{+2}/\text{Fe}^{+3}$ redox on an ITO electrode in a solution of $\text{K}_4\text{Fe}(\text{CN})_6$ and $\text{K}_3\text{Fe}(\text{CN})_6$ is shown in Fig. S2. The redox peak commences at ca 50 mV extending to 500 mV in the positive sweep, which is well-known as the oxidation transition of $\text{Fe}^{+2}/\text{Fe}^{+3}$ couple. Therefore, it is obvious that redox couple of $\text{Fe}^{+2}/\text{Fe}^{+3}$ and co-polymer film first redox pairs are merged together in the CVs of Fig. 4(a).

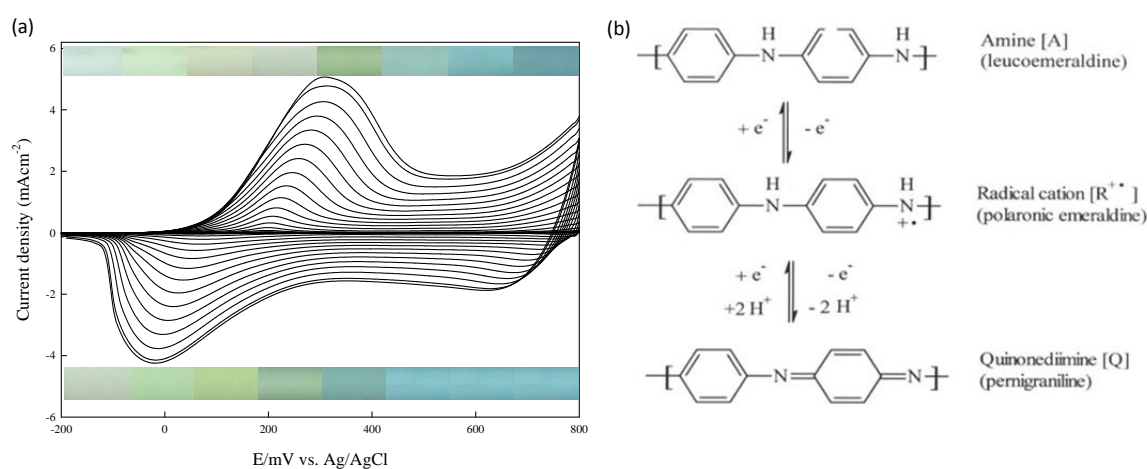


Figure S1. (a) Electropolymerization of 57 mM ANI/MSAN with ANI/MSAN ratio of 0.33 in 0.125 M KCl using cyclic voltammetry on ITO electrodes at a scan ratio of 50mVs^{-1} . (b) Electron transfer between the electrochemical probe and electrode.¹

1. C. H. Yang and T. C. Wen, *J. Electrochem. Soc.*, 1994, **141**, 2624 -2632.

The control electrochemical experiments

Cyclic voltammograms (CVs) of indium tin oxide (ITO) and progesterone-imprinted poly(aniline-*co*-metanilic acid)-coated electrodes in the solution of 125 mM KCl, 5mM $K_4Fe(CN)_6$ and 5 mM $K_3Fe(CN)_6$ and PBS, respectively..

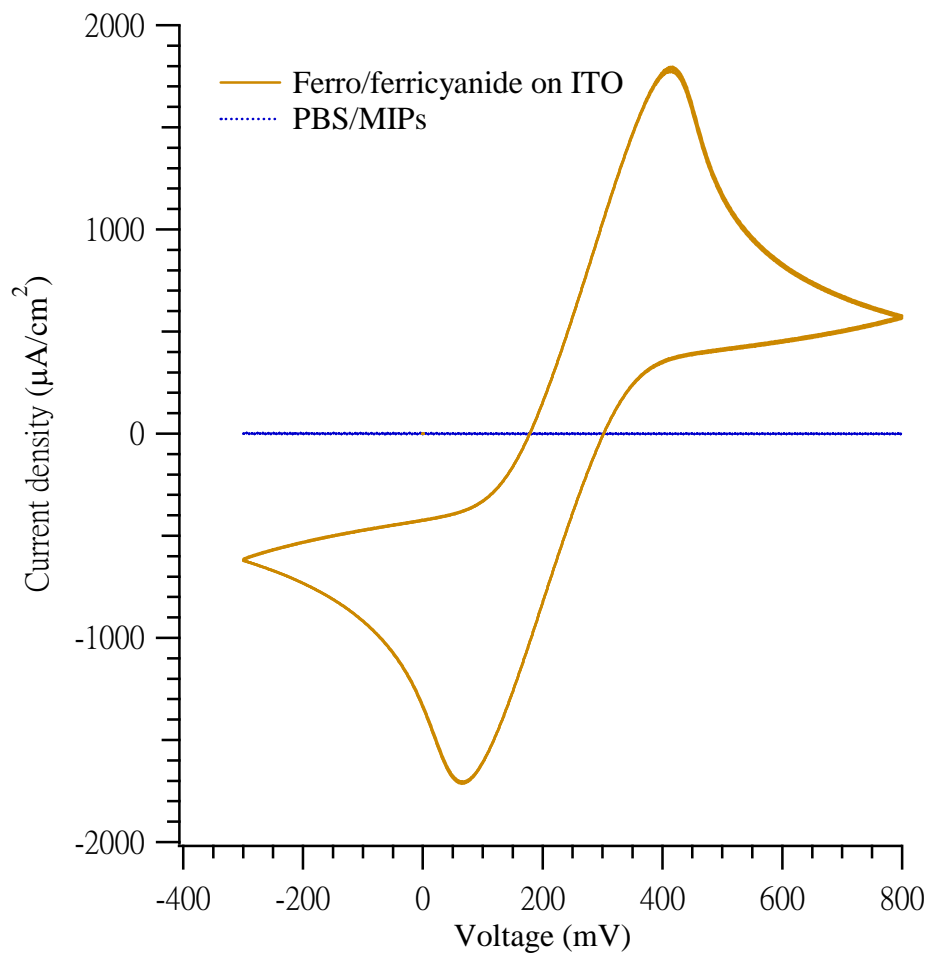


Figure S2. Cyclic voltammograms (CVs) in the solution of 125 mM KCl, 5mM $K_4Fe(CN)_6$ and 5 mM $K_3Fe(CN)_6$ solution on ITO electrodes (orange) and PBS on progesterone-imprinted poly(aniline-*co*-metanilic acid)-coated electrodes (blue).

Surface roughness measurements of progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes

The morphology of the progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes were examined by atomic force microscopy (Solver P47H-PRO, NT-MDT Moscow, Russia). The scanning environment was in air (room temperature and 87% relative humidity) using the tapping mode with scan rate 0.5 Hz. The cantilever was a golden silicon probes (model: NSG01, NT-MDT, Moscow, Russia) with 6 nm probe tip size and 144 kHz resonant frequency.

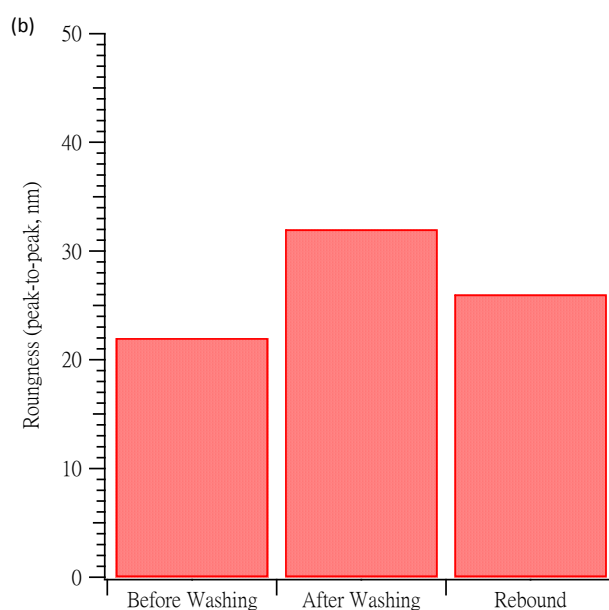
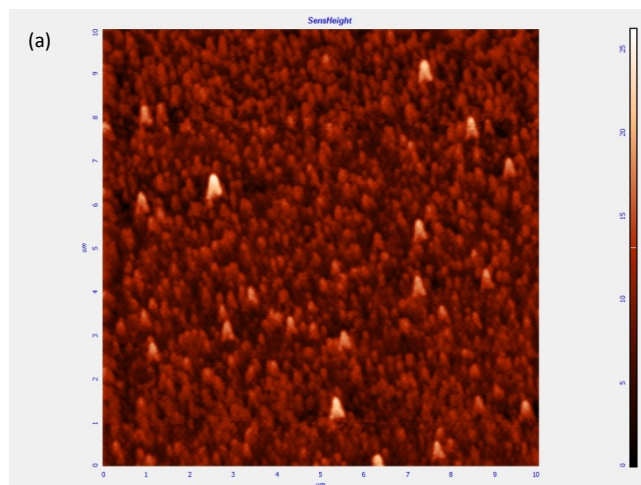


Figure S3. (a) The image of a progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes. (b) The surface peak-to-peak roughness progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes before, after template removal and rebound with progesterone are 22, 32 and 26 nm.

Thickness measurement of the progesterone-imprinted poly(aniline-*co*-metanilic acid)-coated electrode

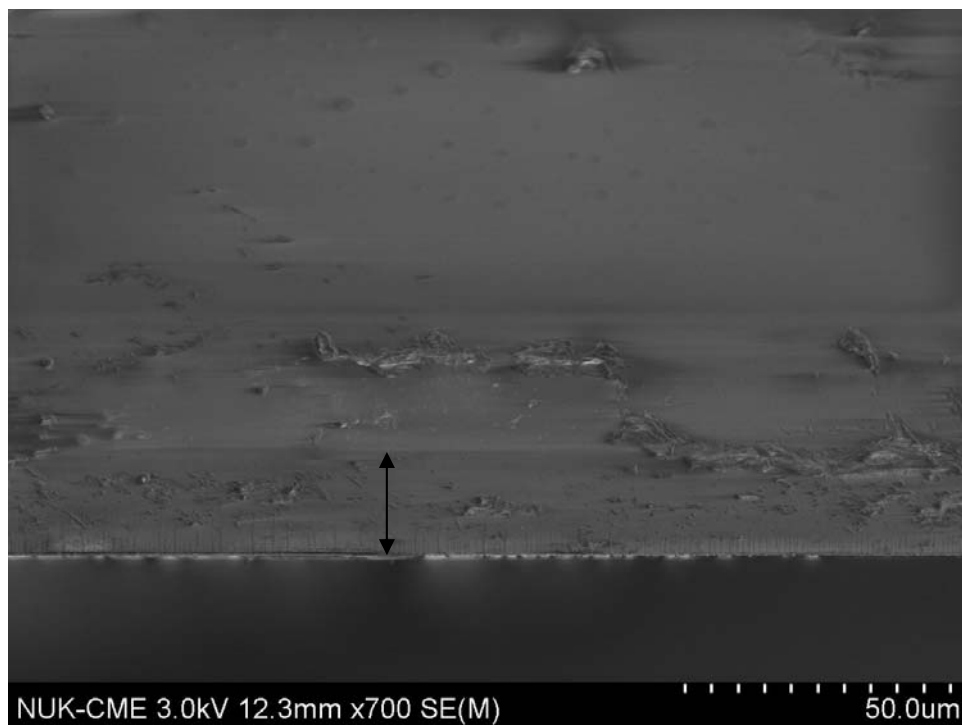


Figure S4. The cross section image of a progesterone-imprinted poly(aniline-*co*-metanilic acid)-coated electrode monitored by a scanning electron microscopy (SEM).

Contact angle measurements of progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes

The water contact angle measurements were performed with a video-based optical contact angle meter (model: FTA-1000B, First Ten Angstroms, Inc., Virginia). progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes were dried with nitrogen gas. A 4 μL droplet of deionized water was then placed on the polymeric thin film [29], and the contact angle measured by video imaging, using the "circle method".

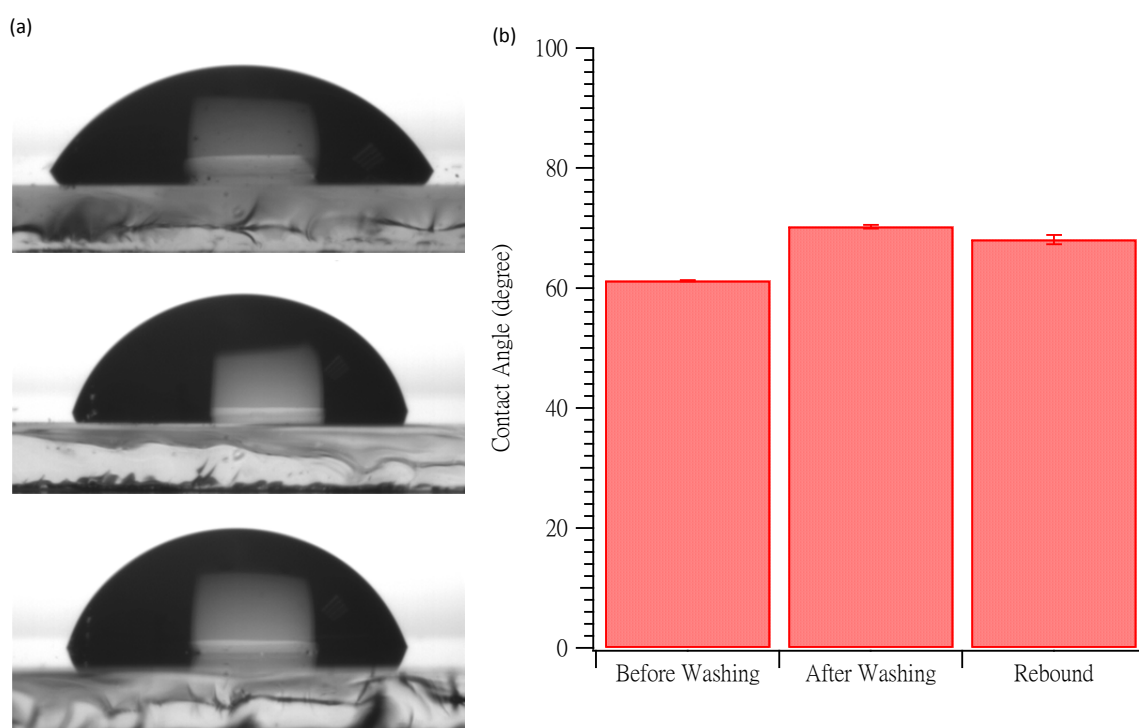


Figure S5. The (a) pictures and (b) contact angles of progesterone-imprinted poly(aniline-co-metaniilic acid)-coated electrodes before, after template removal and rebound with progesterone are 61.2 ± 0.1 , 70.2 ± 0.3 and $68.1 \pm 0.8^\circ$.