Supplementary Information

Label-free rapid detection of Folic acid using a simple one-step synthesis of Niobium iron oxide-based electrochemical transistor

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S1. Effect of pH and scan rate

The pH of PBS used as an electrolyte has significant effect on the sensing performance of an electrochemical sensor, affecting its sensitivity, selectivity and stability. The impact of the electrolyte pH on the electro-oxidation of FA at different pH from pH 5.8–8.6 were investigated as shown in Fig. S1(a). At low pH values, the concentration of hydrogen ions in the solution increases, which can lead to reduction in the sensitivity and stability of the sensor. In contrast, high pH values can result in increased oxidation potential, which can negatively affect the selectivity and sensitivity of a sensor. Additionally, pH can affect the surface charge of the electrode and binding affinity of analyte, which can impact the overall performance of sensor [1]. The scan rate is an important parameter in electrochemical sensing which depends on the various factors such as reaction rate, diffusion coefficient, and mass transport. Fig S1(b) depicts the CV analysis of $NbFeO_4$ modified sensor with different scan rates. A higher scan rate leads to a faster response time, but can also result in lower sensitivity and resolution due to reduced diffusion of analyte at the surface of electrode. On the other hand, a lower scan rate provides better sensitivity and resolution, but can also result in longer measurement times and increased

susceptibility to interference. Therefore, selecting an appropriate scan rate is crucial in achieving optimal performance in electrochemical sensing [2].

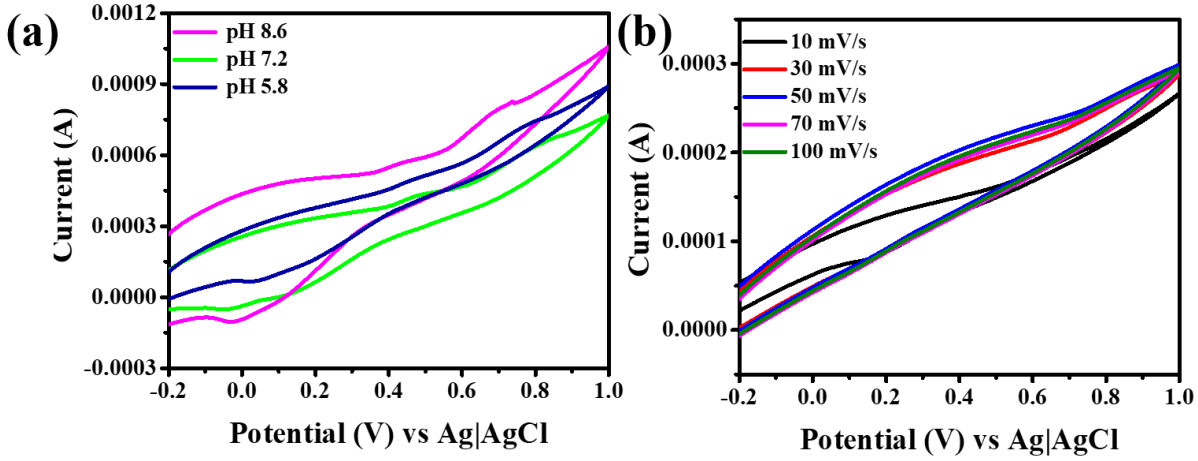

Fig S1 (a) CV analysis of $NbFeO_4$ modified sensor in the presence of FA in PBS of different pH (b) CV analysis of $NbFeO_4$ modified sensor in different scan rates

Table S1. Determination of FA in simulated blood serum using as-fabricated $NbFeO_4$ based sensor under the standard addition method

Sample	FA concentration nM	FA spiked nM	FA recovered	Recovery Percentages	Relative standard Deviation
SBS	0.2	0.2	0.19	95	5
	0.4	0.2	0.39	97.5	2.5
	0.6	0.2	0.70	116	16
	0.8	0.2	0.96	121.4	20.2
	1	0.2	1.20	120	20

References

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2. Heien, M.L., Phillips, P.E., Stuber, G.D., Seipel, A.T. and Wightman, R.M., 2003. Overoxidation of carbon-fiber microelectrodes enhances dopamine adsorption and increases sensitivity. Analyst, 128(12), pp.1413-1419.