Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Iron- core/carbon-shell nanoparticles with intrinsic peroxidase activity: new platform for mimetic glucose detection

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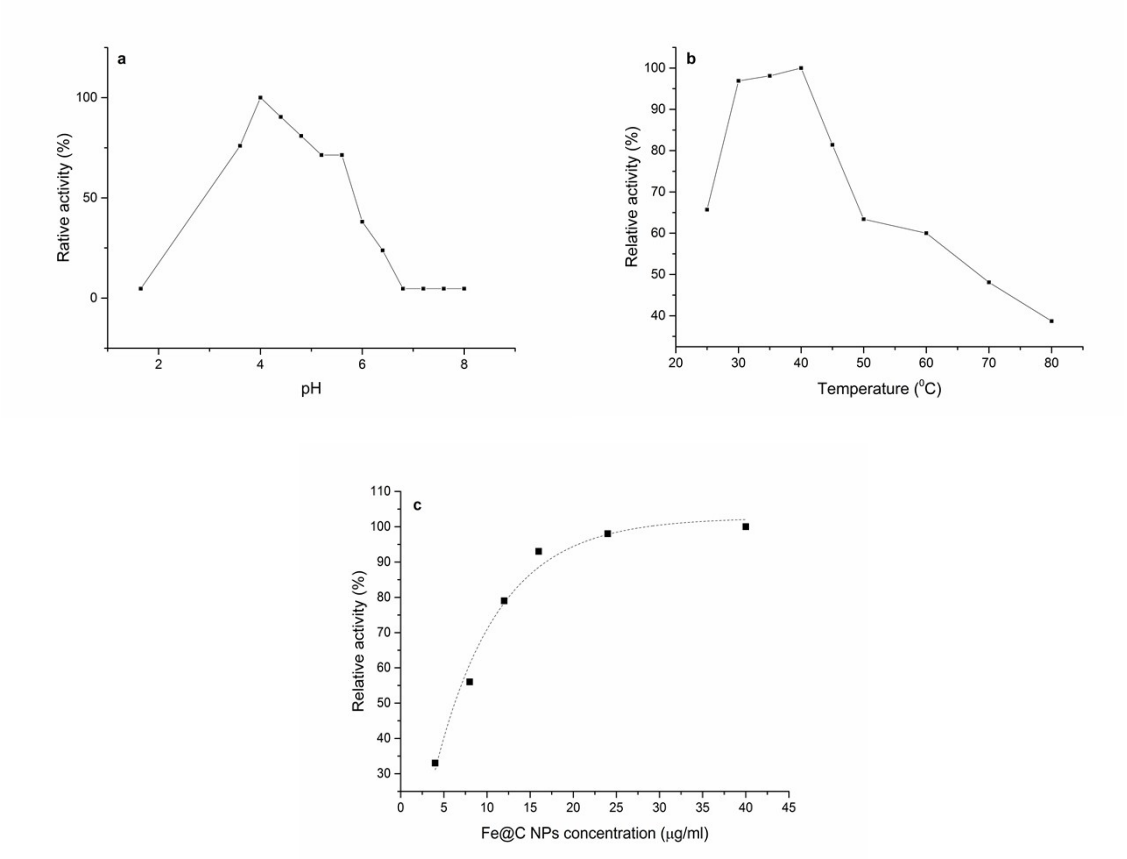

Fig. S1 The peroxidase-like activity of Fe@C nanoparticles in dependence of pH (a), (b) temperature (600μL of 0.1 M NaOAc buffer (pH=3.6) containing 16 μg/ml Fe@C and 1 mM TMB as substrate) (c) Fe@C concentration (600 μL of 0.1 M NaOAc (pH=3,6) at 40 ^{o}C with 1 mM TMB as substrate).

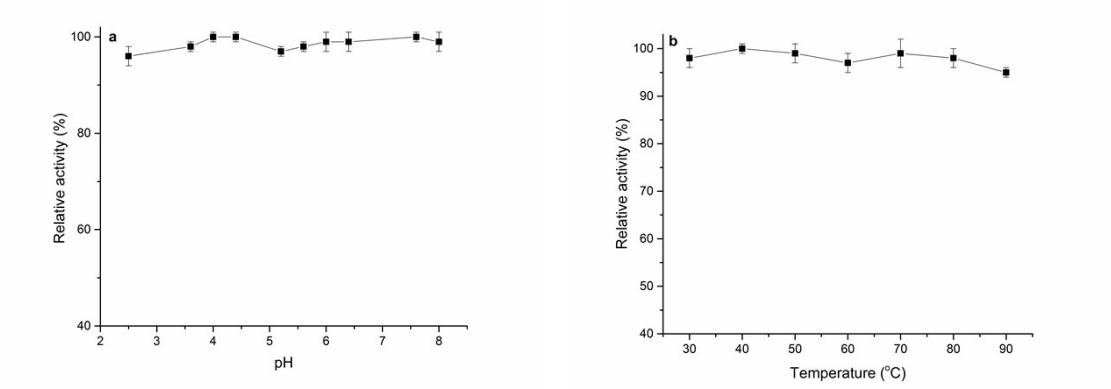

Fig. S2 Dependence of peroxidase-like activity of Fe@C NPs after 2h incubation in solutions with different pH (a) and temperature (b). The relative activity of nanomaterial were measured after five-times washing with water in 600 of 0.1 M NaOAc (pH=3,6) at 40 ^{o}C with 1 mM TMB as substrate. Error bars represent the standard deviation of three measurements.

Table S1 Comparison of the kinetic parameters of Fe@C nanoparticles, HRP and other nanomaterials.

Substrate	**Kinetic parameter**	**PBMNPs**	**Fe_3O_4**	**Fe@C**	**$C_{60}[C(COOH)_2]_2$**	**HRP**	**Fe_3O_4@C**
H_2O_2	K_m (mM)[a]	323,6	154,0	114,4	24,58	3,70	0,072
	V_{max} (Ms^{-1})[b]	$1,2*10^{-6}$	$9.8*10^{-8}$	$35*10^{-8}$	$0.347*10^{-8}$	$8.71*10^{-8}$	$18,0*10^{-8}$
ТМБ	K_m (mM)[a]	0,30	0,098	0,1	0,23	0,43	0,38
	V_{max} (Ms^{-1})[b]	$1,1*10^{-6}$	$3,4*10^{-8}$	$34*10^{-8}$	$0.40*10^{-8}$	$10*10^{-8}$	$74,0*10^{-8}$
Ref.		[1]	[2]	This work	[3]	[2]	[4]

[a] Michaelis constant; [b] maximal reaction velocity

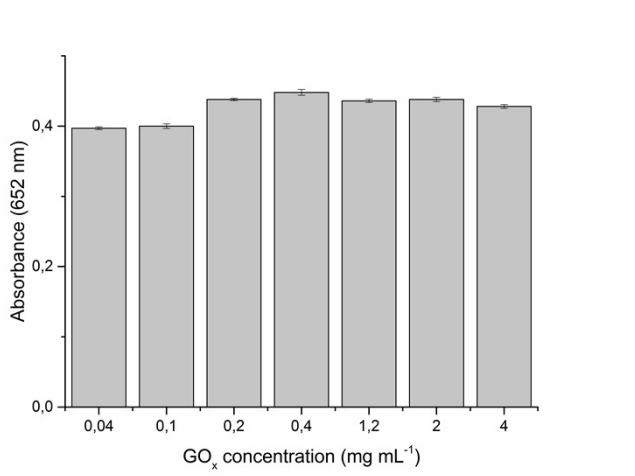

Fig. S3 Absorbance at 652 nm of detection system in dependence of GOx concentration. Experiments were carried out with 1 mM glucose stock solution according to the two-step procedure. Error bars represent the standard deviation of three measurements.

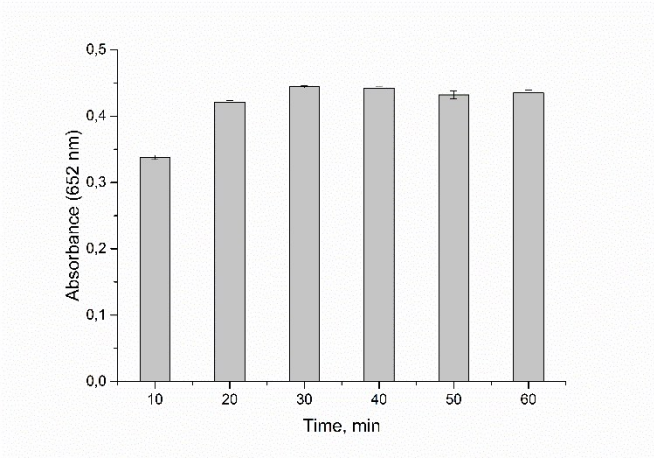

Fig. S4 Absorbance at 652 nm of detection system in dependence of incubation time with GOx. Experiments were carried out with 1 mM glucose stock solution according to the two-step procedure. Error bars represent the standard deviation of three measurements.

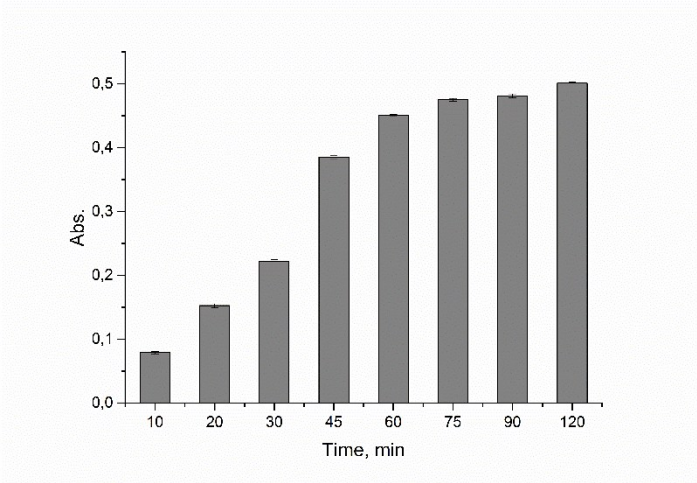

Fig.S5 Dependence of absorbance of detection system at 652 nm in incubation time of the reaction mixtures with Fe@C. Experiments were carried out with 1 mM glucose stock solution according to the two-step procedure. Error bars represent the standard deviation of three measurements.

Table S2 Comparison of colorimetric methods for glucose detection based on enzyme mimics of nanoparticles

Nanomaterial	Linear range (μM)	LOD (μM)	Ref.
$C_{60}[C(COOH)_2]_2$	1-40	0.5	[3]
Fe_3O_4@C	6-100	2	[5]
Fe_3O_4-porphyrin compositions	25-50	2.21	[6]
Graphene oxide–Fe3O4	2–200	0.74	[7]
Nanoceria/DNA	1-200	8.9	[8]
Fe@C	2.31-37.0	0.21	This work

Glucose assay kit

For enzymatic glucose assay, juice samples were diluted 20 folds. Then, 10 μL of diluted juice samples or 10 μL standard glucose solution (10 mM) were added to 1 mL of the standard reagent solution contain GOx and HRP in PBS buffer. The resulting solutions were incubated at 37 ^{o}C for 10 min. Absorbance of each sample were measured at 652 nm. The glucose concentration (mM) of each sample was calculated by the equation:

$$C = \frac{E}{E_c} \cdot 10,$$

where E and E_c is the absorbance of measured sample and calibration standard solution respectively and 10 is the glucose concentration of standard solution.

Table S3 Determination of glucose in juice samples

Juice sample	Result in diluted Samples (6000) (μM)	Added	Recovery (%)	RSD (n=5) %	Experimental Result (mM)	Glucose assay kit (mM)
Banana	19,66			1.21	117.96±1.24	119.70±0.74
Apple	21,54			1.74	129.19±1.96	128.34±0.50
Pea	16,98	5	96.8	2.06	101.95±1.79	99.18±1.17
		10	94.7			
		15	97.2			
		20	98.0			
Strawberry	33,21			3.20	199.67±5.56	199.65±1.40
Pomegranate	34,12			0.97	204.71±1.74	203.41±1.65

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