

Article

Carbon Nanopowder-Based Stochastic Sensor for Ultrasensitive Assay of CA 15-3, CEA and HER2 in Whole Blood

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Citation: Stefan-van Staden, R.-I.; Musat, O.-R.; Gheorghe, D.-C.; Ilie-Mihai, R.-M.; van Staden, J. (Koos) F. Carbon Nanopowder-Based Stochastic Sensor for Ultrasensitive Assay of CA 15-3, CEA and HER2 in Whole Blood. *Nanomaterials* **2022**, *12*, 3111. <https://doi.org/10.3390/nano12183111>

Academic Editors: Daniela Iannazzo and Simone Morais

Received: 24 July 2022

Accepted: 7 September 2022

Published: 8 September 2022

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Supplementary materials

Table S1. The latest method proposed for the assay of CA 15-3, CEA, and HER2.

Biomarker	Tool	Linear concentration range	Limit of determination	Ref.
CEA	Immunosensor	0.01pg mL ⁻¹ – 80.00ng mL ⁻¹	10fg mL ⁻¹	[6]
	Aptamer biosensor	1-30000 pg mL ⁻¹	1pg mL ⁻¹	[7]
	Graphene-based immunosensor	0.1 – 5.0ng mL ⁻¹	0.1ng mL ⁻¹	[8]
	Fe(TPFPP)Cl/AuNp	12.8pg mL ⁻¹ - 20.0μg mL ⁻¹	12.8pg mL ⁻¹	This work
	TPP/AuNp	100fg mL ⁻¹ - 1μg mL ⁻¹	100fg mL ⁻¹	This work
CA 15-3	Immunosensor	0.1fg mL ⁻¹ – 1.0μg mL ⁻¹	0.1fg mL ⁻¹	[9]
	Quantum dots/electrochemiluminescence	10μU mL ⁻¹ -500U mL ⁻¹	10μU mL ⁻¹	[10]
	Fluorescent biosensor	Up to 25.6μU mL ⁻¹	-	[11]
	Fe(TPFPP)Cl/AuNp	100nU mL ⁻¹ - 1000U mL ⁻¹	100nU mL ⁻¹	This work
	TPP/AuNp	100nU mL ⁻¹ - 1000U mL ⁻¹	100nU mL ⁻¹	This work
HER2	Fiber-optic ball-tip resonator	3.7pg mL ⁻¹ – 128.0ng mL ⁻¹	3.7pg mL ⁻¹	[12]
	Bifunctional carbon nanorods	Up to 900pg mL ⁻¹	7fg mL ⁻¹	[13]
	Aptamer based colorimetric sensor	Up to 50.0pmol mL ⁻¹	9.8pmol mL ⁻¹	[14]
	Fe(TPFPP)Cl/AuNp	3.9fg mL ⁻¹ - 30.0pg mL ⁻¹	3.9fg mL ⁻¹	This work
	TPP/AuNp	35fg mL ⁻¹ - 39pg mL ⁻¹	35fg mL ⁻¹	This work

Supplementary materials

Table S2 Determination of CA15-3, CEA, and HER2 in whole blood samples.

Sample no	U mL ⁻³ , CA 15-3			ng mL ⁻³ , CEA			pg mL ⁻³ , HER 2		
				Stochastic microsensors based on					
	Fe(TPFPP)Cl/ AuNp	TPP/AuNp	ELISA	Fe(TPFPP)Cl/ AuNp	TPP/AuNp	ELISA	Fe(TPFPP)Cl/ AuNp	TPP/AuNp	ELISA
1	448.09±0.03	447.52±0.02	450.00±0.12	24.00±0.05	23.18±0.02	24.00±0.12	64.43±0.02	64.40±0.05	63.00±0.17
2	448.12±0.03	449.49±0.05	443.00±0.17	7.18±0.05	7.21±0.03	7.30±0.10	4.96±0.02	4.90±0.03	4.87±0.12
3	206.55±0.05	205.30±0.03	204.00±0.14	17.87±0.04	17.98±0.03	17.00±0.12	61.97±0.04	62.03±0.05	60.00±0.10
4	265.72±0.03	269.13±0.04	260.00±0.12	17.15±0.04	17.78±0.02	16.98±0.13	64.39±0.03	64.22±0.02	64.00±0.11
5	398.64±0.03	398.78±0.02	392.00±0.14	11.80±0.03	11.85±0.03	11.23±0.14	40.94±0.02	39.14±0.05	38.40±0.12
6	448.10±0.03	428.15±0.08	440.10±0.12	13.90±0.04	13.96±0.02	13.15±0.11	33.01±0.02	32.25±0.03	33.10±0.14
7	220.87±0.03	223.15±0.04	221.00±0.15	3.20±0.02	3.19±0.03	3.00±0.14	18.04±0.02	18.00±0.03	17.45±0.13
8	563.86±0.07	569.43±0.03	560.0±0.11	11.14±0.02	11.85±0.03	12.00±0.11	3.36±0.04	3.76±0.05	3.12±0.02
9	303.88±0.04	304.20±0.03	300.00±0.15	12.00±0.03	11.79±0.02	11.50±0.14	27.97±0.03	28.03±0.05	25.50±0.12
10	111.35±0.03	118.40±0.05	115.20±0.14	8.50±0.02	8.43±0.03	8.50±0.12	28.51±0.03	28.28±0.02	27.50±0.11
t-test	2.13	2.21	-	2.61	2.29		2.41	2.38	-