Buteinylated-Hafnium Oxide Bionanoparticles for Electrochemical Sensing of Wogonin

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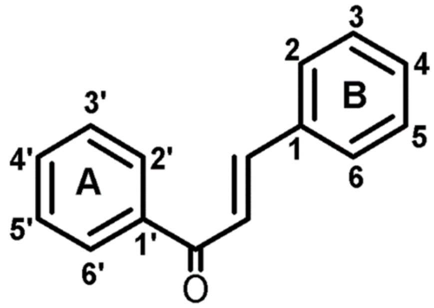

Fig.S1 illustrates the general skeletal of chalcone.

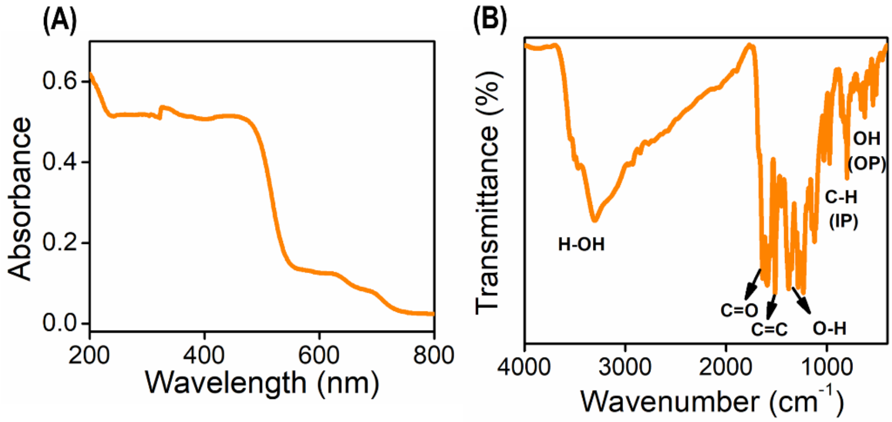

Fig.S2. UV-DRS and FTIR spectra of butein.

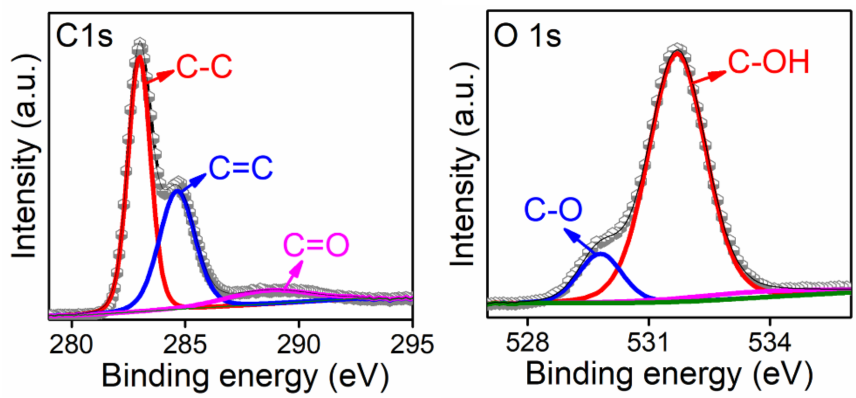

Fig.S3 XPS deconvoluted C1s and O1s spectra of butein.

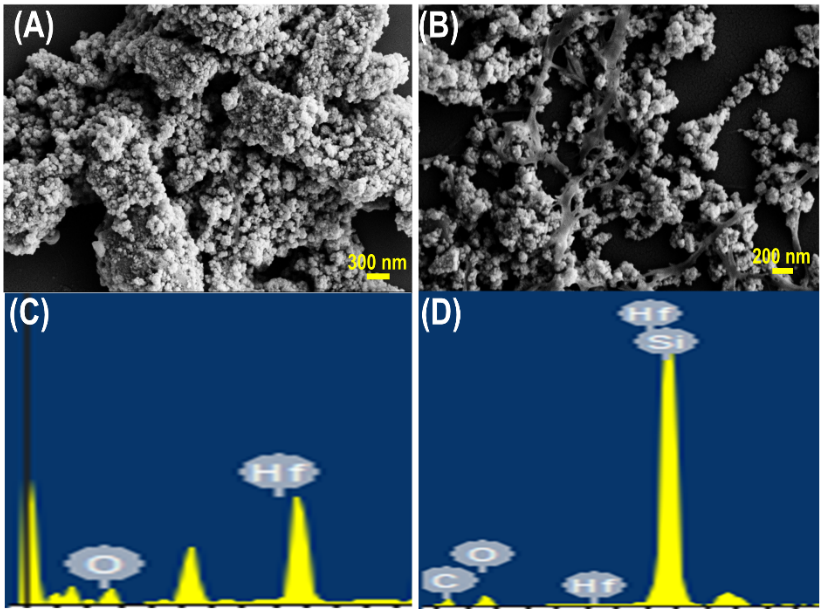

Fig.S4 FESEM and EDAX analysis of HfO_2 (A&C) and HfO_2-B (B&D).

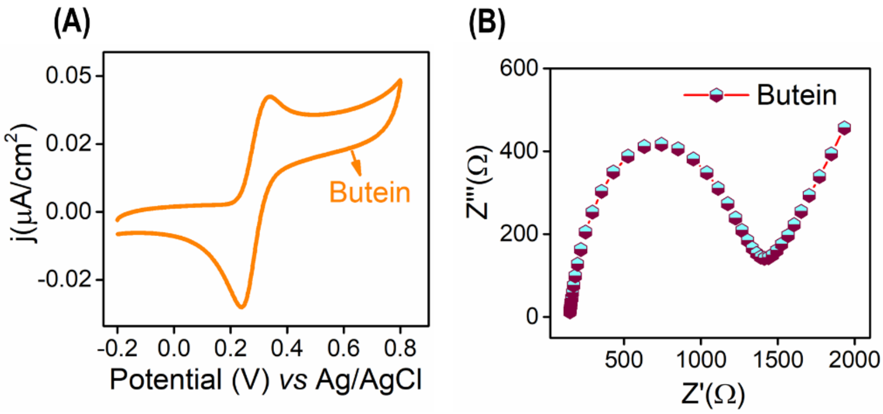

Fig.S5 CV and EIS of pristine Butein in BR buffer (pH 7) at 50 mV/s and 0.05 M of $K_3[Fe(CN)_6]$ and $K_4[Fe(CN)_6]$ in 0.5 M KCl solution, respectively.

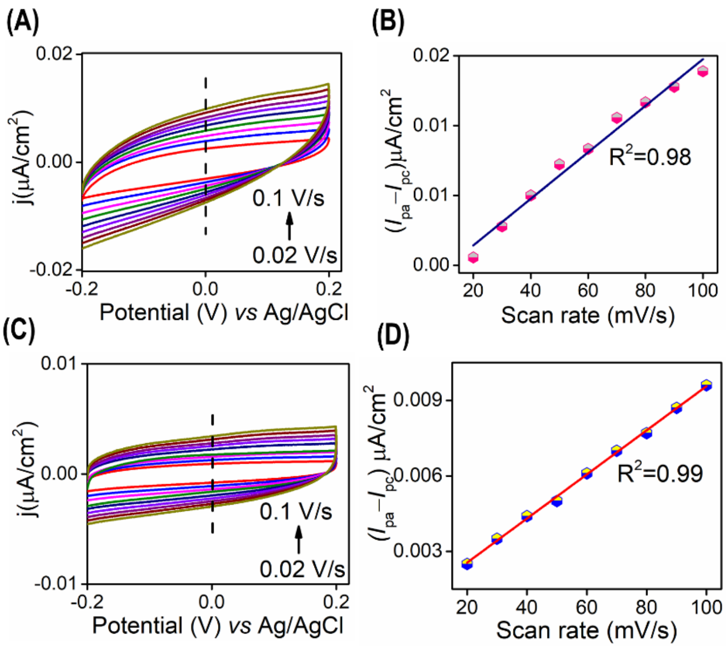

Fig.S6 (A-B) CVs of HfO_2 and its linear plot. (C-D) HfO_2-B and its linear plot. Recorded in the potential window of –0.2 to +0.2 V at different scan rates in BR buffer (pH 7).

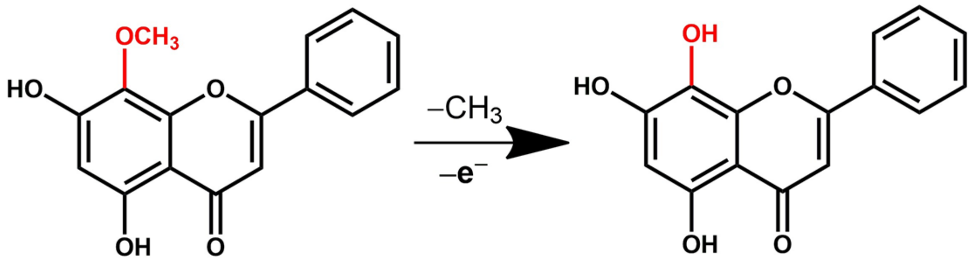

Fig. S7 Electrooxidation behaviour of WG at the HfO_2-B modified surface.

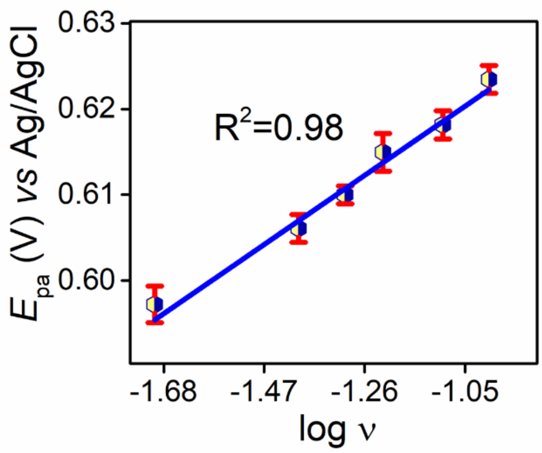

Fig.S8 Derivative plot of anodic peak potential of WG against the logarithm of scan rate.

Table S1. Similar polyphenols used in the sensing of various analytes

Material	Method	Technique	Target	References
Tannic acid + Metal ions	Electrochemical	Anodic stripping voltammetry	Epstein-Barr virus Infection	[1]
Catechin modified carbon paste electrode	Electrochemical	Differential Pulse Voltammetry	Dopamine (DA) and Serotonin (ST)	[2]
Ellagic acid + Carbon quantum dots	Spectrochemica l	Fluorescence	Hg^{2+}	[3]
Tannic acid + Copper and Zinc	Spectrochemica l	Fluorescence	Nucleic acid	[4]
Apigenin modified GCE	Electrochemical	Differential pulse voltammogram	Copper ions in Soil	[5]
Molybdenum trioxide hybridized kaempferol modified GCE	Electrochemical	Amperometry	Immunosensor	[6]
Butein + Hafnium oxide NPs modified GCE	Electrochemical	Amperometry	Wogonin	This work

Table S2. Comparison of WG detection using various analytical technique.

Method	**Material**	**Limit of detection**	**Real application**	**Reference**
High Performance Liquid chromatography (HPLC)	C8 column Mobile phase: Acetonitrile, Water and Diethylamine	0.01 µg/mL	Rat plasma	[7]
Capillary Electrophoresis	Acetonitrile + Microemulsion + Borax solution	0.5 -1.2 µg/mL	-	[8]
Electrospray Ionization Tandem Mass Spectrometry	C-18 column Mobile phase: methanol and formic acid	5 ng/mL	Plasma	[9]
Liquid chromatography with tandem mass spectrometric detection (HPLC–MS/MS)	C-18 column Mobile phase: Formic acid and Acetonitrile	24 ng/mL	Rat Plasma	[10]
Ultra-performance liquid chromatography-mass spectrometry (UPLC-MS)	C-18 column Mobile phase: Methanol and Water	153.87 ng/mL	Rat plasma	[11]
Electrochemical study	HfO_2-B modified GCE in Britton Robinson (BR) buffer	0.63 µM	Human Serum	This work

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