

# Voltammetric detection of Irbesartan by Molecularly Imprinted Polymer (MIP)-modified screen-printed electrodes

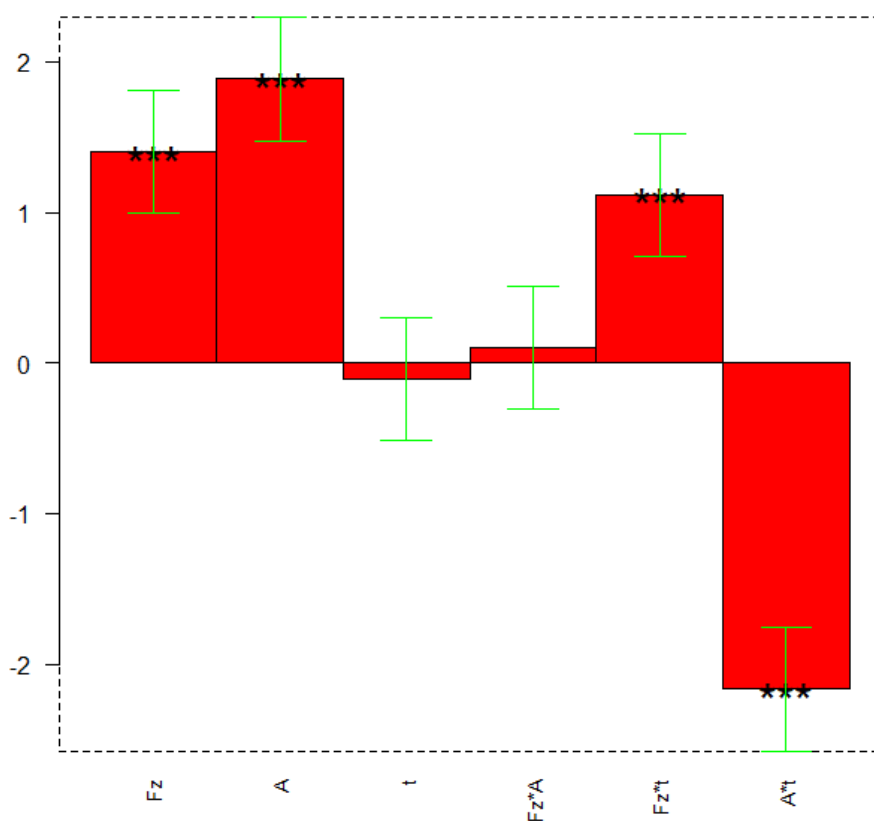
Camilla Zanoni<sup>1</sup>, Riccardo Roviola<sup>1</sup>, Lisa Rita Magnaghi<sup>1,2</sup> Raffaella Biesuz<sup>1,2</sup> and Giancarla Alberti<sup>1,\*</sup>

## Irbesartan determination by square wave voltammetry (SWV): optimization of the experimental conditions by a full factorial design 2<sup>3</sup>

### a) Bare electrode

**Table S1.** Optimization of the SWV experimental conditions for the bare electrode by a Full Factorial Design 2<sup>3</sup>: level definitions for the parameters considered

Parameter	Minimum level (-1)	Maximum level (+1)
Frequency (Fz, Hz)	1	50
Impulse amplitude (A, mV)	50	100
Equilibration time (t, s)	120	300



**Figure S1.** DoE to optimize SWV experimental conditions for the bare electrode. The greatest values and little black stars (regardless of the sign) suggest a significant influence of the respective parameter or interaction and significance (\*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ ).

The model equation can be written as follows:

$$i_p = b_0 + b_1 \cdot Fz + b_2 \cdot A + b_3 \cdot t + b_{12} \cdot Fz \cdot A + b_{13} \cdot Fz \cdot t + b_{23} \cdot A \cdot t$$

**Table S2.** Coefficients and significance (\*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ ) calculated for the optimization of the SWV experimental conditions for the bare electrode by a Full Factorial Design <sup>23</sup>.

Coefficient	Value	Significance
$b_0$	5.586	
$b_1$	1.402	***
$b_2$	1.886	***
$b_3$	-0.104	
$b_{12}$	0.102	
$b_{13}$	1.117	***
$b_{23}$	-2.166	***

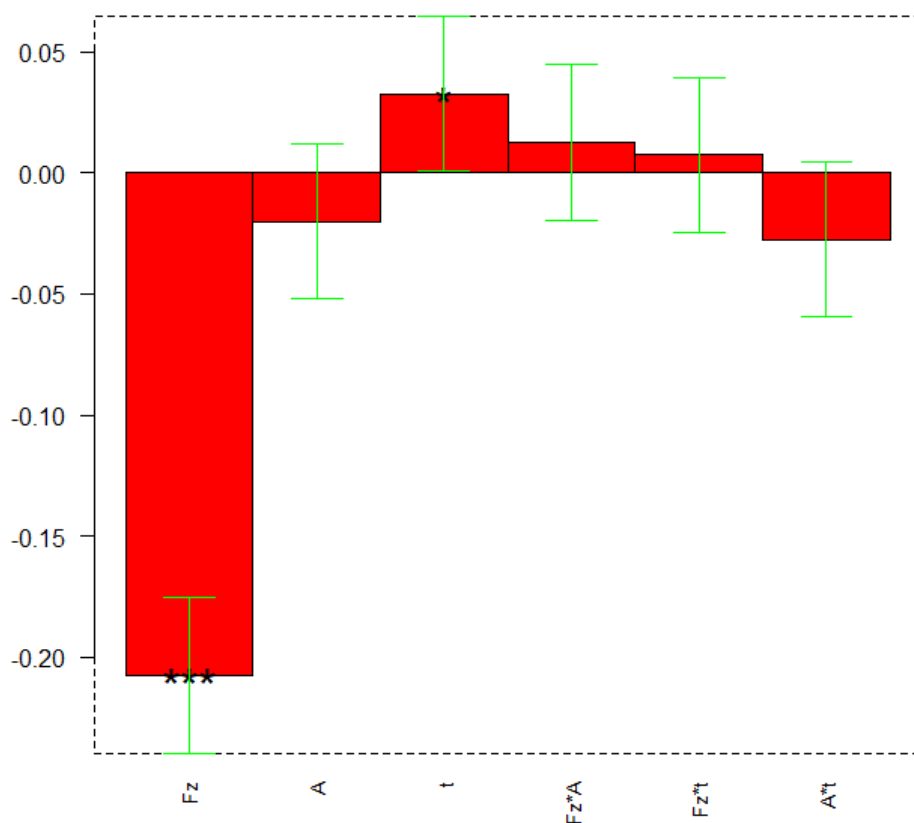
**Table S3.** Optimization of the SWV experimental conditions for the bare electrode by a Full Factorial Design <sup>23</sup>: model validation by six replicates of the center point [0 0 0], i.e.,  $Fz=25$  Hz,  $A=75$  mV and  $t = 210$  s. CI = confidence interval at 95% confidence level.

	$i_p$ ( $\mu A$ )
Average	5.5
Standard deviation	0.8
Upper bound CI	6.4
Lower bound CI	4.6
Predicted response ( $b_0$ )	5.586

*b) MIP(NIP)-modified electrode.*

**Table S4.** Optimization of the SWV experimental conditions for the MIP(NIP)-modified electrode by a Full Factorial Design <sup>23</sup>: level definitions for the parameters considered

Parameter	Minimum level (-1)	Maximum level (+1)
Frequency ( $Fz$ , Hz)	1	10
Impulse amplitude ( $A$ , mV)	50	100
Equilibration time ( $t$ , s)	210	300



**Figure S2.** DoE to optimize SWV experimental conditions for the MIP(NIP)-modified electrode. The greatest values and little black stars (regardless of the sign) suggest a significant influence of the respective parameter or interaction and significance (\*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ ).

The model equation can be written as follows:

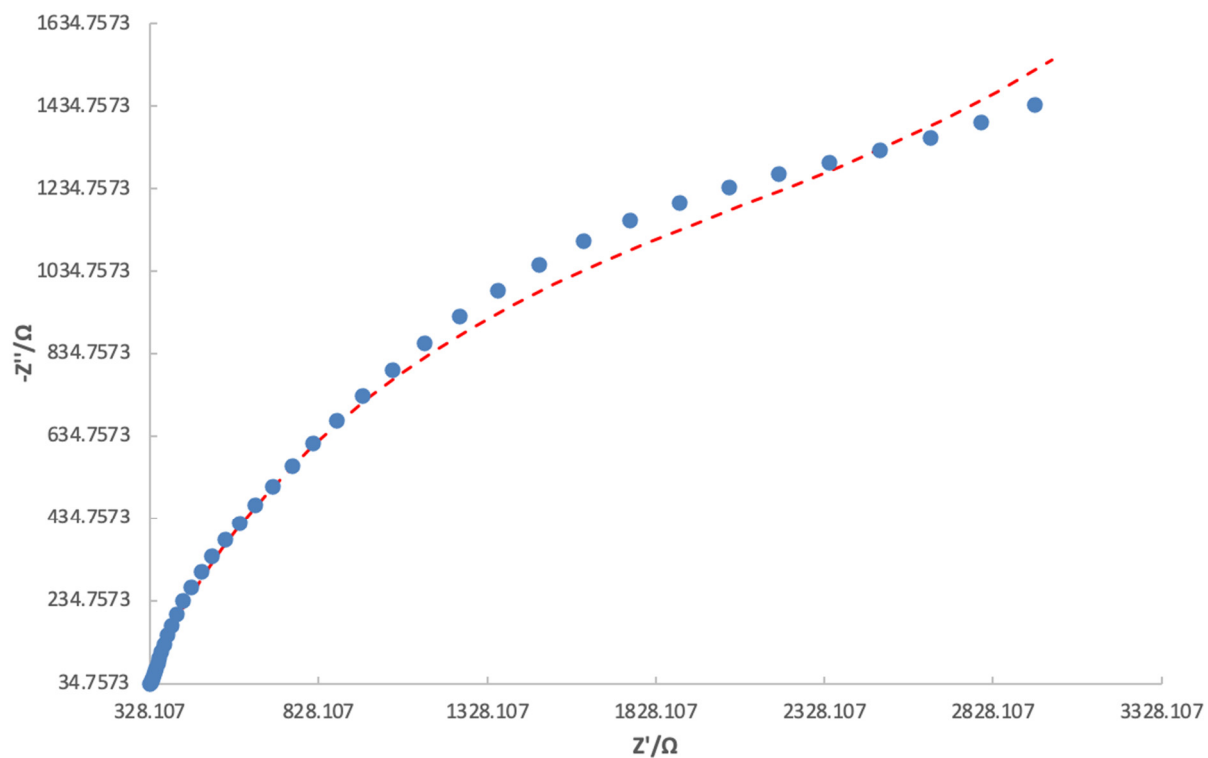
$$i_p = b_0 + b_1 \cdot Fz + b_2 \cdot A + b_3 \cdot t + b_{12} \cdot Fz \cdot A + b_{13} \cdot Fz \cdot t + b_{23} \cdot A \cdot t$$

**Table S5.** Coefficients and significance (\*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ ) calculated for the optimization of the SWV experimental conditions for the MIP(NIP)-modified electrode by a Full Factorial Design  $2^3$ .

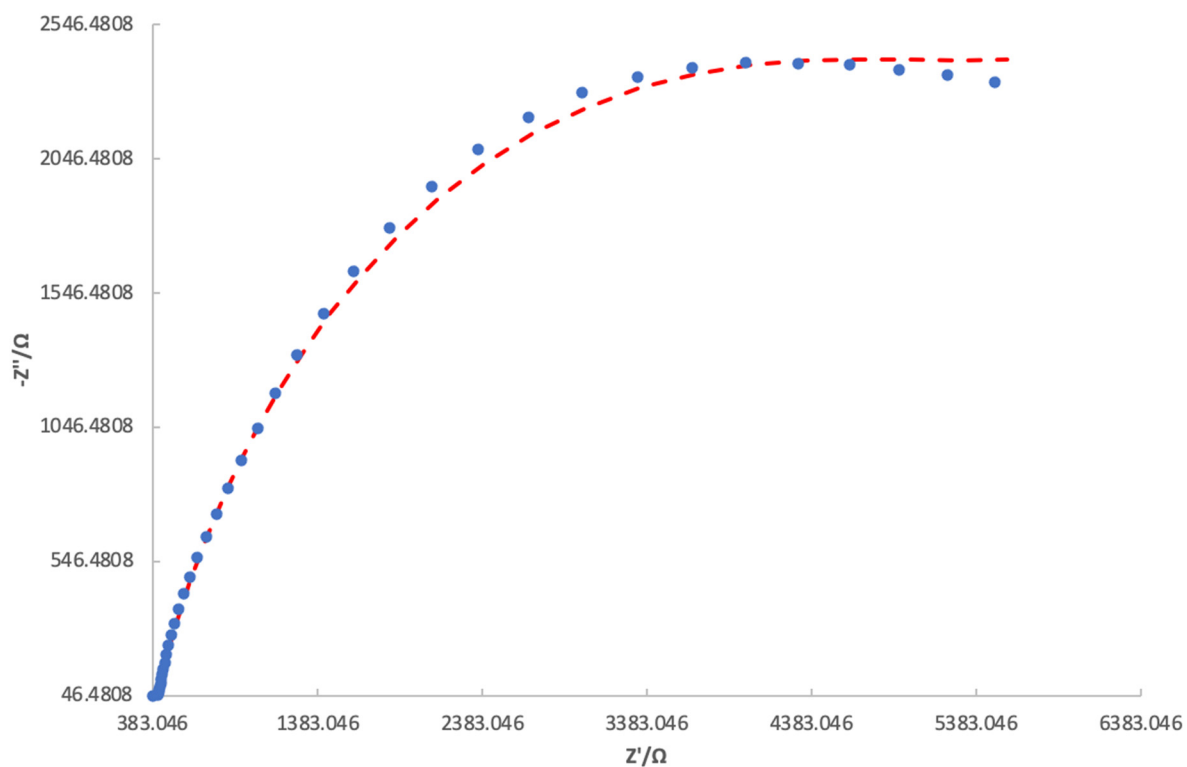
Coefficient	Value	Significance
$b_0$	0.2975	
$b_1$	-0.2075	***
$b_2$	-0.02	
$b_3$	0.0325	*
$b_{12}$	0.0125	
$b_{13}$	0.0075	
$b_{23}$	-0.0275	

**Table S6.** Optimization of the SWV experimental conditions for the MIP(NIP)-modified electrode by a Full Factorial Design  $2^3$ : model validation by six replicates of the center point [0 0 0], i.e., Fz=5 Hz, A=75 mV and  $t = 120$  s. CI = confidence interval at 95% confidence level.

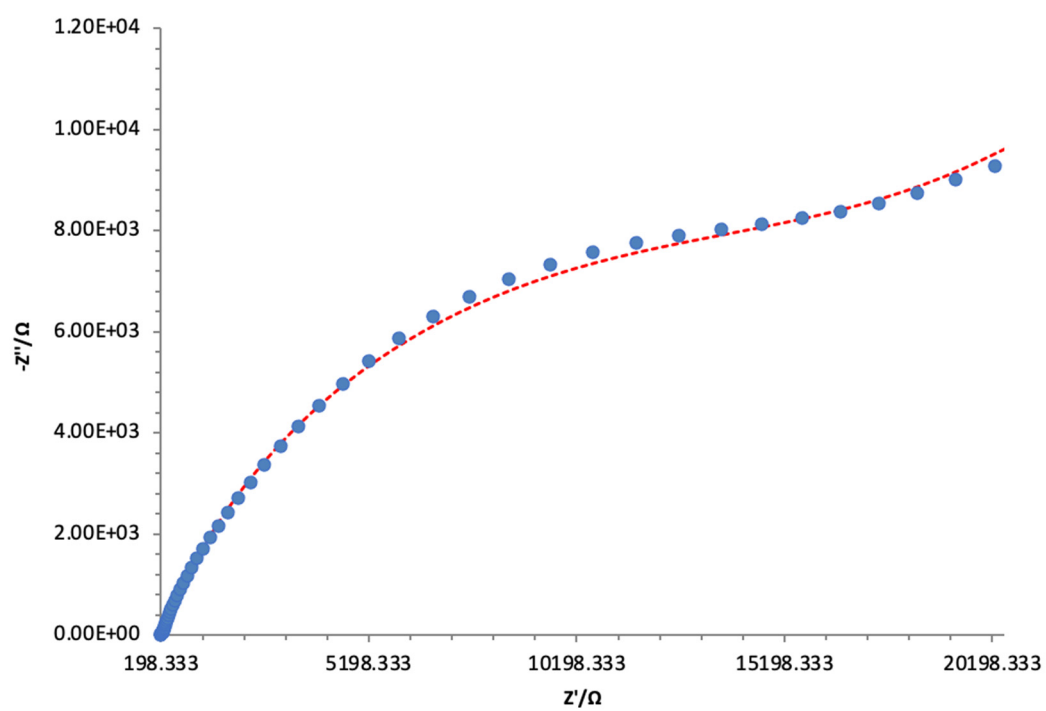
	$i_p$ ( $\mu A$ )
Average	0.299
Standard deviation	0.003
Upper bound CI	0.302
Lower bound CI	0.296
Predicted response ( $b_0$ )	0.2975



**Figure S3.** Nyquist plots of the MIP-modified electrode after the template removal. Electrochemical probe: 5 mM  $K_4Fe(CN)_6$ /0.1 M KCl solution at pH 7.2.



**Figure S4.** Nyquist plots of the cleaned MIP-modified electrode after contact with IRB solution. Electrochemical probe: 5 mM  $K_4Fe(CN)_6$ /0.1 M KCl solution at pH 7.2.



**Figure S5.** Nyquist plots of the NIP-modified electrode. Electrochemical probe: 5 mM  $\text{K}_4\text{Fe}(\text{CN})_6$ /0.1 M KCl solution at pH 7.2.