

# Electronic Supplementary Material

## Determination of $\beta_2$ -Agonist Residues in Meat Samples by gas chromatography-mass spectrometry with N-doped Carbon Dots-in-Molecular sieves

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CONTENTS

1. The schematic diagram of  $\beta_2$ -agonists structure .....2

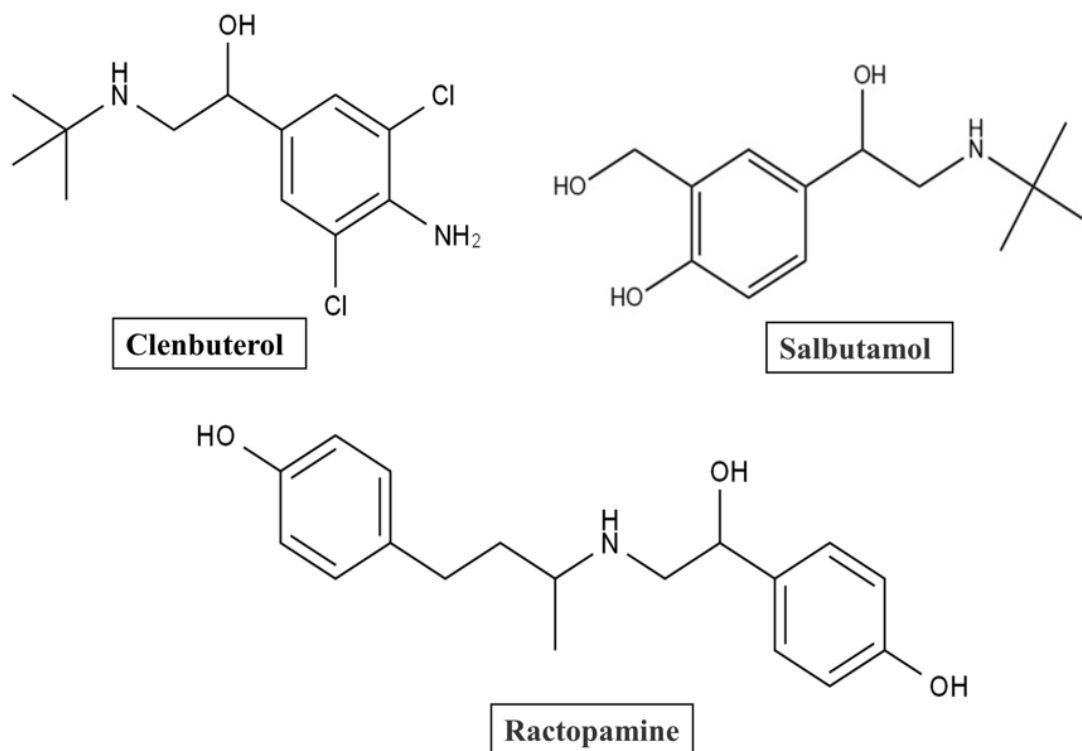
2. The setting parameters of GC-MS .....5

3. Kinetic parameters for the adsorption.....5

4. Isotherm parameters for the adsorption .....6

5. The mass spectra of  $\beta_2$ -agonists.....7


## 1. The schematic diagram of $\beta_2$ -agonists structure



**Figure S1.** The schematic diagram of  $\beta_2$ -agonists structure (clenbuterol, salbutamol and ractopamine).

## 2. The setting parameters of GC-MS

**Table S1.** The retention times, qualitative ions, and quantitative ions for each  $\beta_2$ -agonist in the method.

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	Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license ( <a href="https://creativecommons.org/licenses/by/4.0/">https://creativecommons.org/licenses/by/4.0/</a> ).	Compounds	$t_R$ (min)	Confirmation ions ( $m \cdot z^{-1}$ )	Quantification ions ( $m \cdot z^{-1}$ )
1		Clenbuterol	14.568	86, 187, 212, 243, 264	86
2		Salbutamol	14.906	73, 147, 212, 262, 369	369
3		Ractopamine	22.751	58, 179, 193, 267, 301	301

3. Kinetic parameters for the adsorption

Table S2. Kinetic parameters for the adsorption of Clenbuterol on ZMS@N-CQDs.

Q <sub>e</sub> (μg·mg <sup>-1</sup> )	Pseudo-first-order			Pseudo-second-order		
	Q <sub>e,1</sub> (μg·mg <sup>-1</sup> )	K <sub>1</sub> (min <sup>-1</sup> )	R <sup>2</sup>	Q <sub>e,2</sub> (μg·mg <sup>-1</sup> )	K <sub>2</sub> (min <sup>-1</sup> )	R <sup>2</sup>
13.3	12.9	0.7884	0.9909	12.4	5.3900	0.9863

Q<sub>e</sub>: Experimental equilibrium adsorption amount;  
Q<sub>e,1</sub>: Calculated equilibrium adsorption amount from the Pseudo-first order kinetics;  
Q<sub>e,2</sub>: Calculated equilibrium adsorption amount from the Pseudo-second order kinetics.

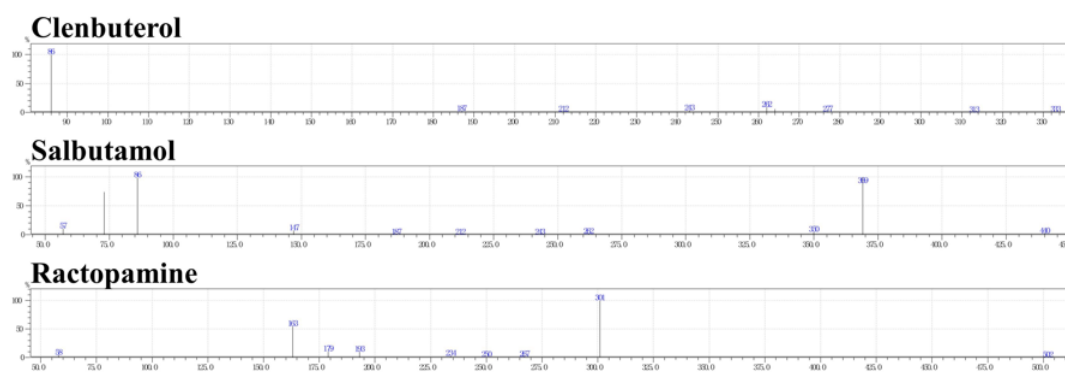
4. Isotherm parameters for the adsorption

Table S3. Adsorption isotherm parameters of Clenbuterol on ZMS@N-CQDs.

$Q_m(\text{ng}\cdot\text{mg}^{-1})$	Langmuir			Freundlich		
	$Q_{m,1}(\text{ng}\cdot\text{mg}^{-1})$	$K_L(\text{mL}\cdot\text{ng}^{-1})$	$R^2$	$KF(\text{ng}^{n-1/n}/\text{mL}^{1/n}/\text{mg})$	$n$	$R^2$
30.00	29.83	0.0194	0.9999	3.1992	0.9976	0.9642

$Q_m$ : Experimental maximum adsorption amount;  
 $Q_{m,1}$ : Calculated maximum adsorption amount from Langmuir isothermal adsorption curves.

## 5. The mass spectra of $\beta_2$ -agonists



**Figure S2.** The mass spectra of each  $\beta_2$ -agonist used in this method.

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