

Electronic Supplementary Information (ESI)

for

**A simple high-yield synthesis of high-purity Hägg carbide
(χ -Fe₅C₂) nanoparticles with extraordinary electrochemical
properties**

Ondřej Malina[#], Petr Jakubec[#], Josef Kašlík, Jiří Tuček* and Radek Zbořil*

Regional Centre of Advanced Technologies and Materials, Departments of Experimental
Physics and Physical Chemistry, Faculty of Science, Palacký University in Olomouc,
Šlechtitelů 27, 783 71 Olomouc, Czech Republic.

[#] These authors contributed equally.

* Corresponding authors: E-mail addresses: jiri.tucek@upol.cz (Jiří Tuček) and
radek.zboril@upol.cz (Radek Zbořil).

Number of tables: 2

Number of pages: 2

Table S1. Values of the Mössbauer hyperfine parameters, derived from the zero-field ^{57}Fe Mössbauer spectrum of the prepared $\chi\text{-Fe}_5\text{C}_2$ sample, recorded at room temperature (300 K), where δ is the isomer shift, ΔE_Q is the quadrupole splitting, B_{hf} is the hyperfine magnetic field, and RA is relative spectra area of each spectral component identified during spectrum fitting.

Component	$\delta \pm 0.01$ (mm/s)	$\Delta E_Q \pm 0.01$ (mm/s)	$B_{\text{hf}} \pm 0.3$ (T)	RA ± 1 (%)	Assignment
Sextet	0.24	0.09	21.5	39	$\chi\text{-Fe}_5\text{C}_2$ - I
Sextet	0.17	0.06	18.2	33	$\chi\text{-Fe}_5\text{C}_2$ - II
Sextet	0.22	0.13	10.9	23	$\chi\text{-Fe}_5\text{C}_2$ - III
Sextet	0.20	0.03	19.9	5	$\theta\text{-Fe}_3\text{C}$

Table S2. Comparison of various electrochemical methods for the quantification of metronidazole, where LoD is the limit of detection, LoQ is the limit of quantification, SWV is the square wave voltammetry, DPV is the differential pulse voltammetry, and CV is the cyclic voltammetry.*

Electrode	Technique	Linear range (mol L ⁻¹)	LoD (mol L ⁻¹)	LoQ (mol L ⁻¹)	Reference
CFME	SWV	$1 \times 10^{-6} - 2.2 \times 10^{-5}$	5×10^{-7}	1×10^{-6}	1
CPE/TMHP	DPV	$1 \times 10^{-3} - 1 \times 10^{-5}$	4.36×10^{-6}	n/a	2
CPE/ α -CD	DPV	$0.5 \times 10^{-6} - 103.0 \times 10^{-6}$	0.28×10^{-6}	n/a	3
GCE/Ni/Fe-LDH	CV	$5 \times 10^{-6} - 1595 \times 10^{-6}$	58×10^{-6}	n/a	4
SPCE/Ag NPs-IL	DPV	$3.1 \times 10^{-6} - 310 \times 10^{-6}$	0.4×10^{-6}	n/a	5
GCE/ $\chi\text{-Fe}_5\text{C}_2$	SWV	$10 \times 10^{-6} - 100 \times 10^{-6}$	2.8×10^{-6}	9.3×10^{-6}	This work

* References:

1. P. N. Bartlett, E. Ghoneim, G. El-Hefnawy and I. El-Hallag, *Talanta*, 2005, **66**, 869–874.
2. R. Joseph and K. G. Kumar, *Anal. Lett.*, 2009, **42**, 2309–2321.
3. A. Hernandez-Jimenez, G. Roa-Morales, H. Reyes-Perez, P. Balderas-Hernandez, C. E. Barrera Diaz and M. Bernabe-Pineda, *Electroanalysis*, 2016, **28**, 704–710.
4. K. Nejati and K. Asadpour-Zeynali, *Mater. Sci. Eng. C-Mater. Biol. Appl.*, 2014, **35**, 179–184.
5. S. Sadeghi, M. Hemmati and A. Garmroodi, *Electroanalysis*, 2013, **25**, 316–322.