

SUPPLEMENTARY INFORMATION

Surface modification of banana stem fibers via radiation induced grafting of poly(methacrylic acid) as effective cation exchanger for Hg(II)

N. Salamun,^a S. Triwahyono,^{ab*} A. A. Jalil,^{cd} Z. A. Majid,^a Z. Ghazali,^e N. A. F. Othman,^e D. Prasetyoko^f

^a Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

^b Centre for Sustainable Nanomaterials, Ibnu Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

^c Department of Chemical Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

^d Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

^e Malaysian Nuclear Agency, Radiation Processing Technology, Bangi, 43000, Kajang, Selangor, Malaysia

^f Department of Chemistry, Institut Teknologi Sepuluh Nopember, Keputih Sukolilo Surabaya 60111, Indonesia

Table S1 Peak area of C=O form Gaussian curve fitting

Adsorbent	Peak area of C=O ^a	
	1717	1664
BSF	-	-
BSF-β ₄₀	42.8	28.5
BSF-MW ₆₀₀	12.2	25.9
BSF-C _{0.01}	11.4	18.1

^a Gaussian deconvolution area

Table S2 Swelling percentages of ungrafted and grafted BSF

Ungrafted BSF		BSF-β		BSF-MW			BSF-C		
%S	Dose (kGy)	%DG	%S	Microwave power (W)	%DG	%S	Conc. of KPS initiator (mol L ⁻¹)	%DG	%S
350	20	10.5	200	300	14.3	180	0.002	11.7	185
	40	79.2	100	450	23.3	160	0.009	20.6	165
	60	77.9	80	600	34.2	150	0.018	17.7	140
	80	51.8	60	800	33.2	120	0.036	14	135

Table S3 Parameters of kinetic and intraparticle diffusion study for the Hg(II) adsorption on BSF- β_{40} at different temperatures

T (K)	$q_{e,exp}$ mg g ⁻¹	Pseudo-first-order			Pseudo-second-order			Intraparticle diffusion		
		k_1 min ⁻¹	$q_{e,calc}$ mg g ⁻¹	R^2	k_2 g mg ⁻¹ min ⁻¹	$q_{e,calc}$ mg g ⁻¹	R^2	k_{id}	C_i mg g ⁻¹	R^2
303	77.8	0.029	84.1	0.980	2.3x10 ⁻⁴	117.8	0.965	8.1	1.1	0.855
313	105.1	0.039	107.8	0.994	2.9x10 ⁻⁴	133.5	0.985	9.3	16.1	0.887
323	119.4	0.045	120.7	0.995	3.3x10 ⁻⁴	146.1	0.987	9.7	26.8	0.849
333	134.2	0.047	136	0.998	3.3x10 ⁻⁴	164	0.987	10.8	32.8	0.819

Table S4 Thermodynamic parameters for the Hg(II) biosorption on BSF- β_{40} at different temperatures

ΔG° (kJ mol ⁻¹)	ΔH° (kJ mol ⁻¹)	ΔS° (J mol ⁻¹ K ⁻¹)	E_a (kJ mol ⁻¹)
4.3			
3.1	21.7	58.4	13.7
2.8			
2.5			

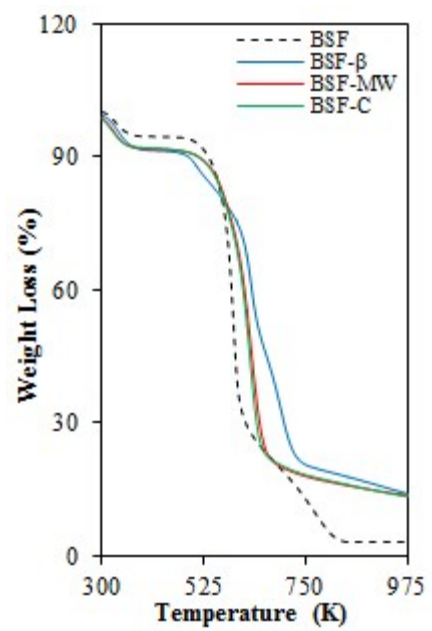


Fig. S1 Thermogravimetry analysis of BSF based adsorbents