Supplementary Information

3D Printed Graphene-Biopolymer Aerogel for Water Contaminant Removal: A Proof of Concept

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Submitted to

Environmental Science: Nano

December 20, 2020

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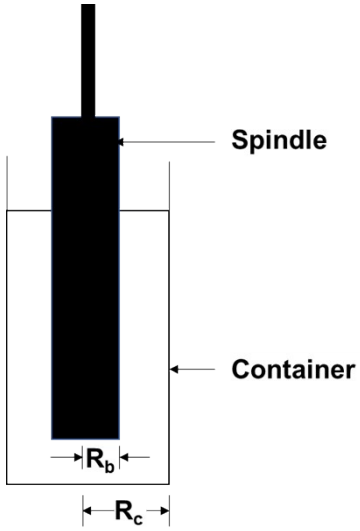
1. Shear Rate Calculation for Rotational Viscometer:



Shear rate (s^{-1}) = $\frac{2\omega {R_c}^2 {R_b}^2}{X^2\left({R_c}^2 - {R_b}^2\right)}$ ……..(Equation 1)[1]

Where, ω = angular velocity of spindle (rad/s) $\left[= \frac{2\pi}{60} . N\right]$,

N = spindle rotation per minute (rpm)

R_c = radius of container (mm)

R_b = radius of the spindle

X = radius at which shear rate is calculated (mm)

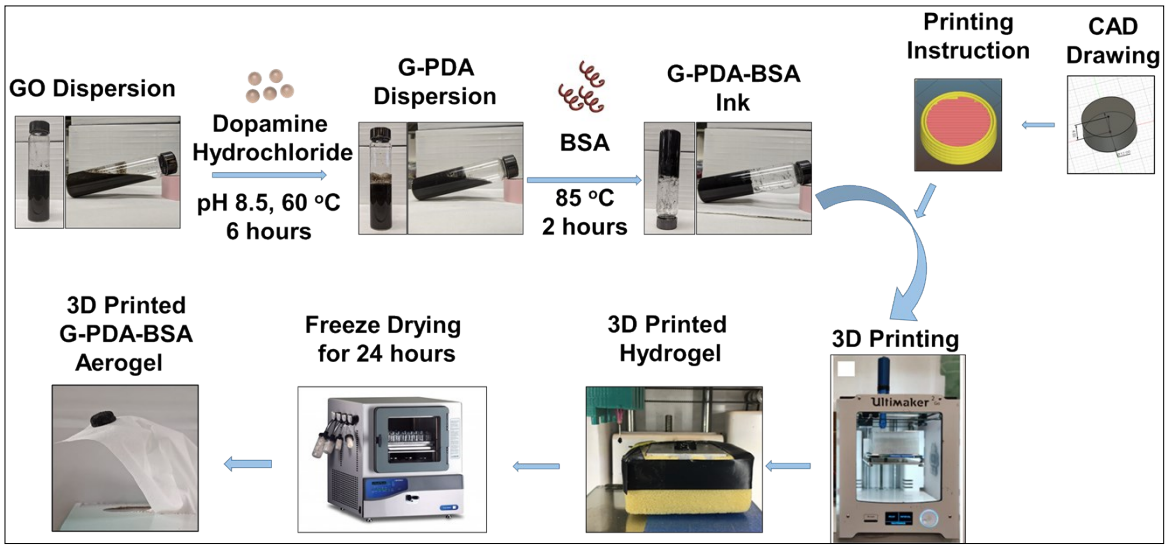
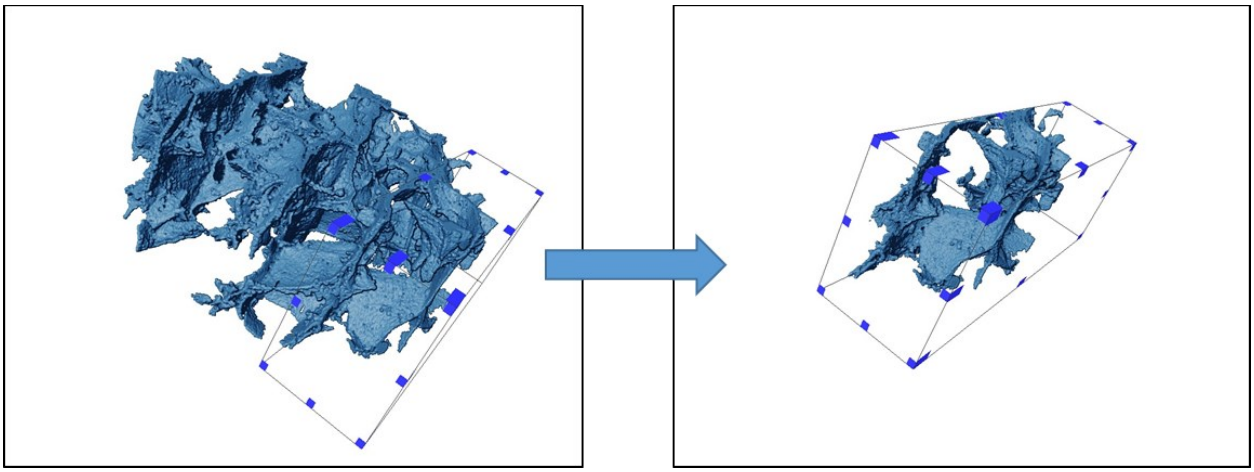


Figure S1. Summary of the steps involved in the entire 3D printing process of G-PDA-BSA aerogel.

46 

47 Figure S2. Segmented section (blue rectangular box) of the G-PDA aerogel.

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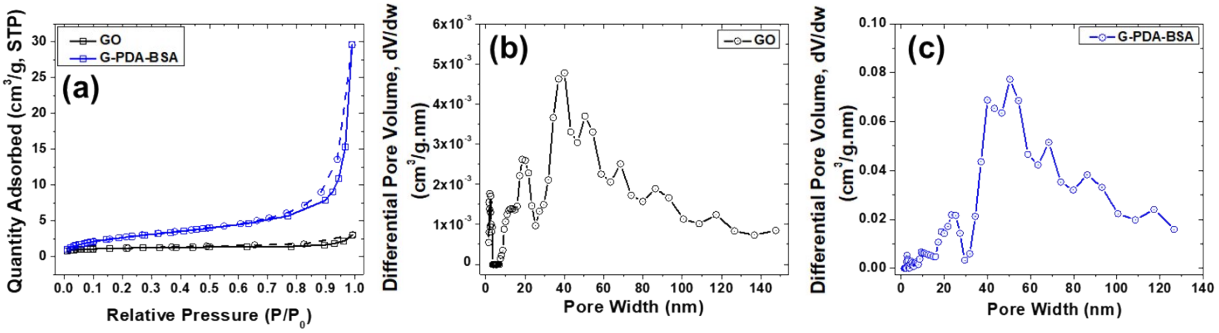


Figure S3: (a) N_2 adsorption-desorption isotherm for GO and G-PDA-BSA. The solid line represents adsorption isotherm whereas the dotted line represents desorption isotherm and differential pore volume distribution as function of pore width for (b) GO and (c) G-PDA-BSA aerogel

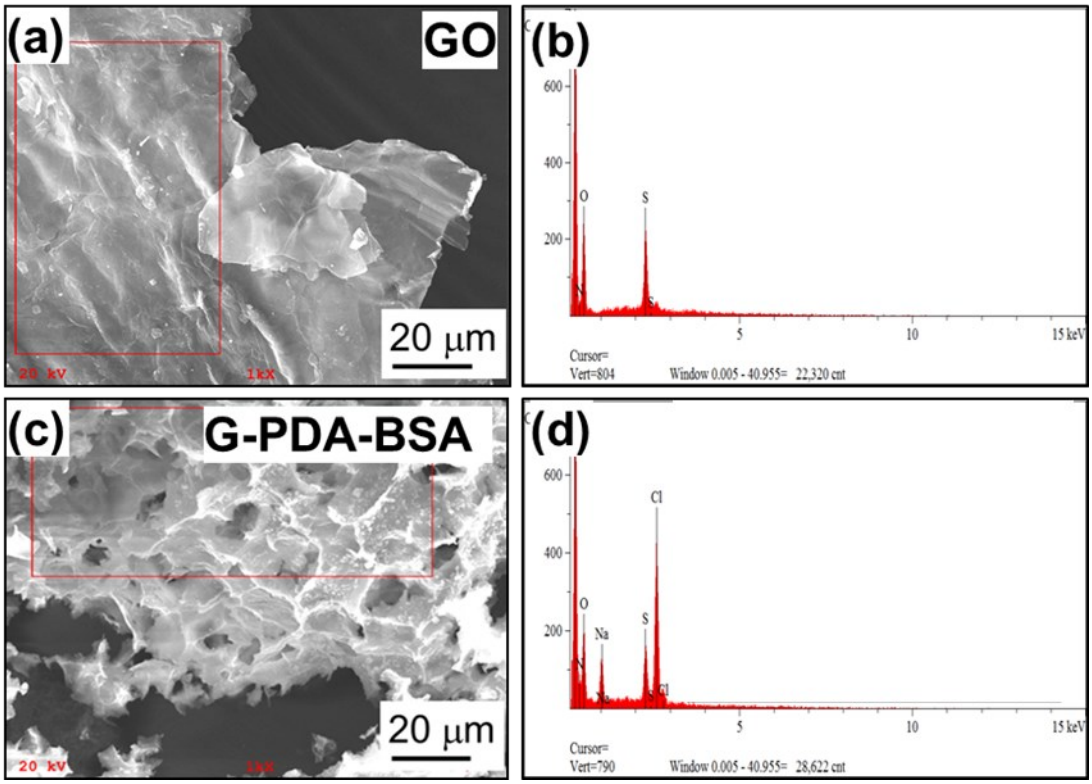
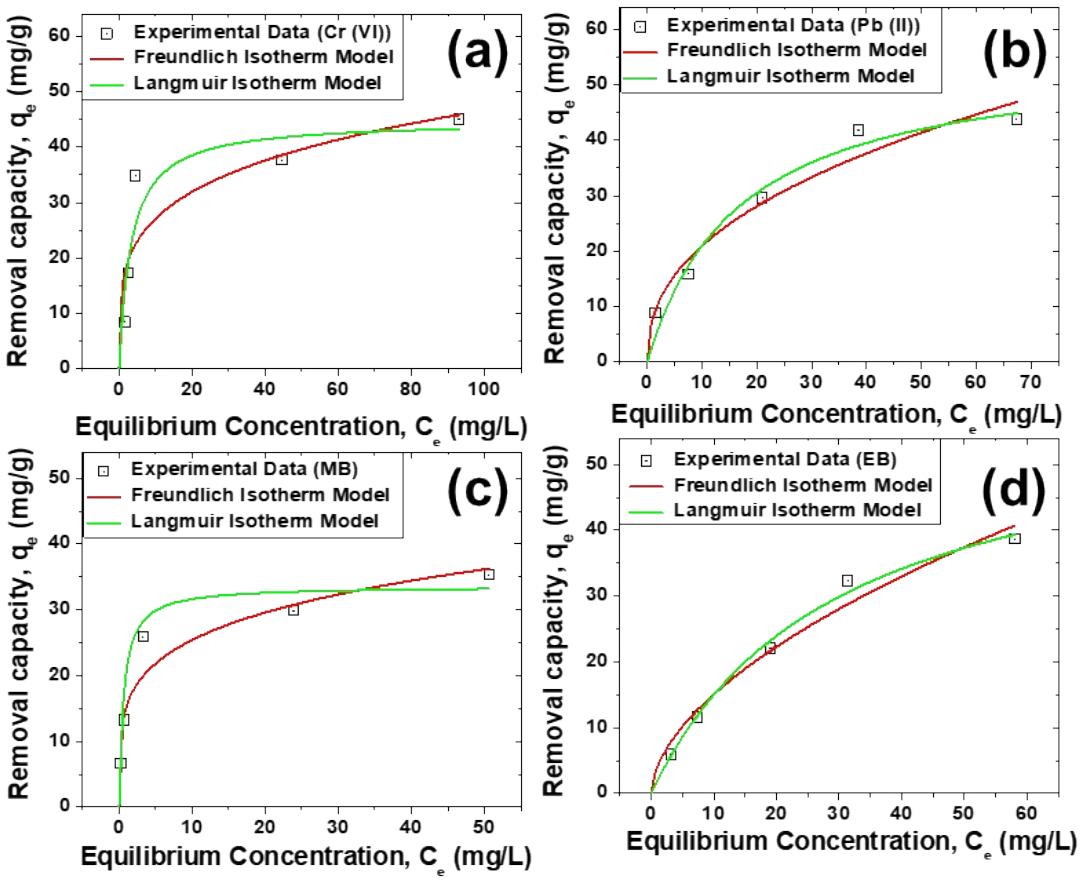


Figure S4. SEM and EDS spectra of GO (a & b) and G-PDA-BSA aerogel (c & d)



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59 Figure S5. Equilibrium adsorption isotherms for (a) Cr (VI), (b) Pb (II), (c) MB, and (d) EB with

60 fitted isotherm model curves

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63 Table S1: Apparent viscosity of dispersions at different rotations of Rotational Viscometer

Rotation (rpm)	Shear rate (s^{-1})	Apparent viscosity (mPa.s)		
		GO	G-PDA	G-PDA-BSA
6	1.27	32	220	98300
12	2.54	28	130	49050
30	6.36	21	120	19140
60	12.71	17	44	9520

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66 Table S2: Expressions of isotherm models

Isotherm Model	Non-linear Expression	Parameters
Langmuir	$q_e = \frac{bq_m C_e}{1 + bC_e}$	b = Langmuir isotherm Constant associated with energy of adsorption (L/mg) q_m = Maximum monolayer adsorption capacity (mg/g)
Freundlich	$q_e = K_f C_e^{\frac{1}{n}}$	K_f = Freundlich isotherm constant associated with adsorption capacity (mg/g)(L/g)$^{\frac{1}{n}}$ n = Freundlich isotherm constant associated with adsorption intensity

67 Where, q_e = Adsorption capacity at equilibrium (mg/g) (dependent variable)

68 C_e = Equilibrium concentration in adsorbate (mg/L) (independent variable)

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Table S3: Values of Isotherm model parameters for different contaminants

Contaminant	Langmuir Isotherm Model			Freundlich Isotherm Model		
	b (L/mg)	q_m (mg/g)	Adjusted R^2	K_f (mg/g)(L/g) $\frac{1}{n}$	n	Adjusted R^2
Cr (VI)	0.31	44.78	0.79	15.81	4.26	0.65
Pb (II)	0.06	55.96	0.95	7.97	2.38	0.94
MB	1.62	33.60	0.91	15.37	4.57	0.87
EB	0.03	59.41	0.99	4.10	1.77	0.96

References

1. Brookfield, E., More solutions to sticky problems. *Brookfield Engineering Labs., Editor* **2005**.