

Supplemental materials for:

## Flocculation of livestock wastewater using cationic starch prepared from potato peels

Noor Haleem,<sup>ab</sup> Augustina Osabutey,<sup>a</sup> Karlee Albert,<sup>c</sup> Cheng Zhang,<sup>\*d</sup> Kyungnan Min,<sup>e</sup>

Gary Anderson<sup>a</sup> and Xufei Yang<sup>\*a</sup>

<sup>a</sup> Department of Agricultural and Biosystems Engineering, South Dakota State University, Brookings, SD 57007, USA

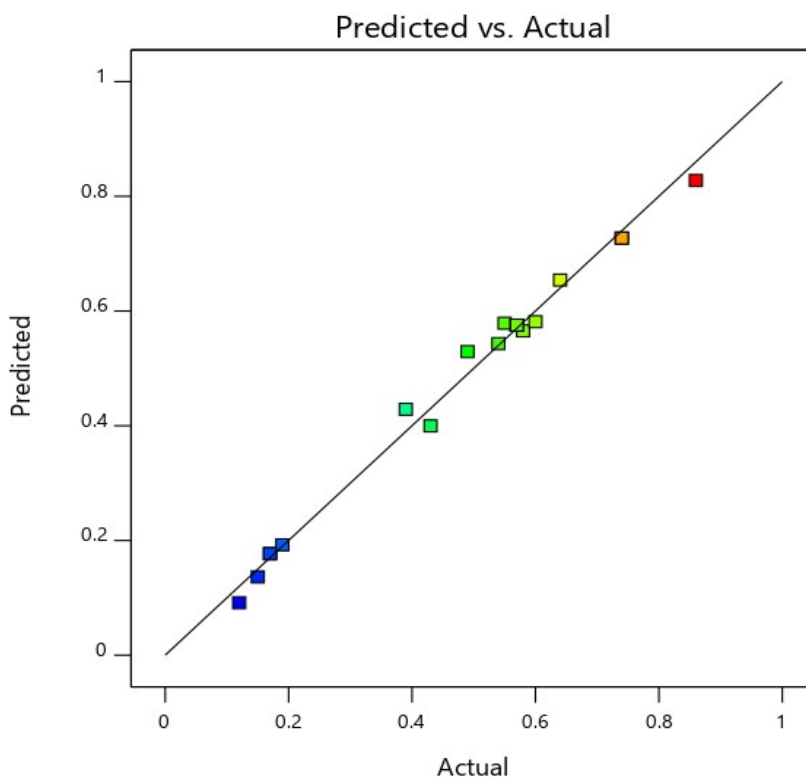
<sup>b</sup> Institute of Environmental Sciences and Engineering (IESE), National University of Sciences and Technology (NUST), Islamabad 44000, Pakistan

<sup>c</sup> Department of Biology and Microbiology, South Dakota State University, Brookings, SD 57007, USA

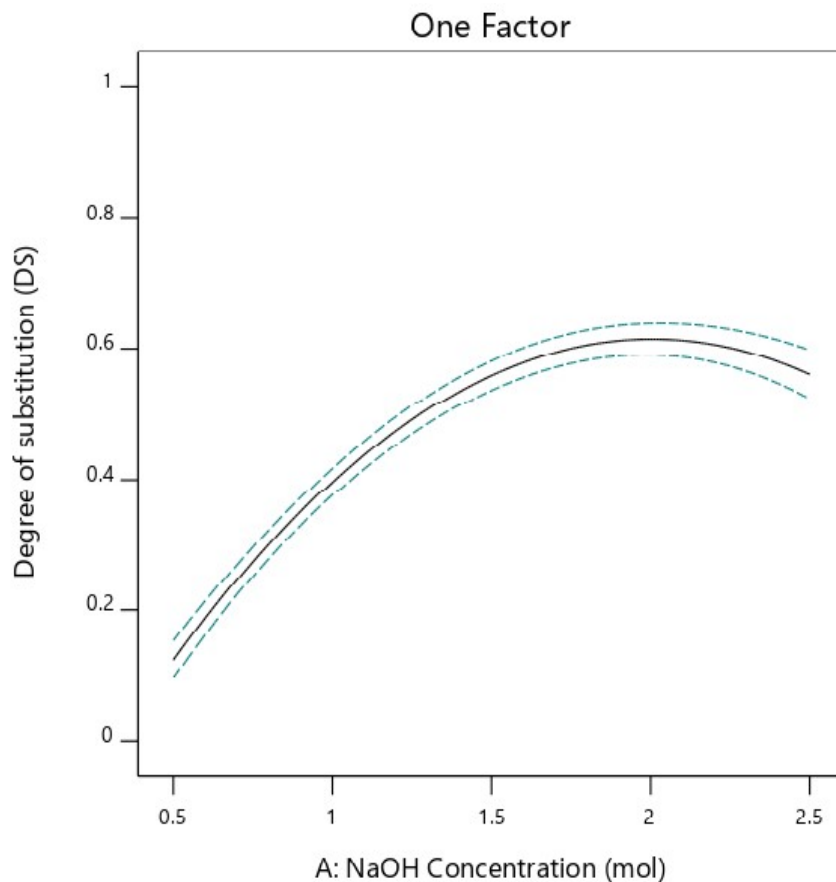
<sup>d</sup> Department of Chemistry and Biochemistry, South Dakota State University, Brookings, SD 57007, USA

<sup>e</sup> Department of Civil and Environmental Engineering, South Dakota State University, Brookings, SD 57007, USA

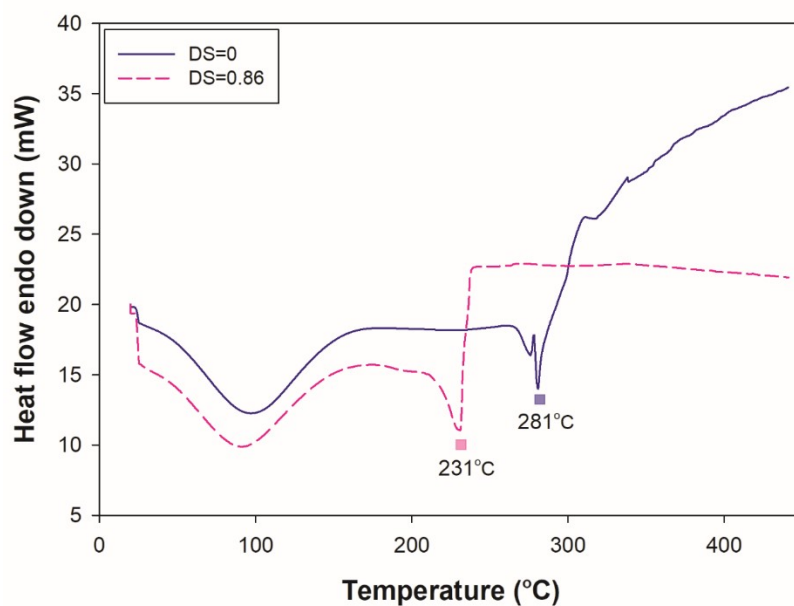
\* Corresponding author; Tel: +1 605 688 5141; E-mails: [cheng.zhang@sdstate.edu](mailto:cheng.zhang@sdstate.edu); [xufei.yang@sdstate.edu](mailto:xufei.yang@sdstate.edu)



**Fig. S1.** Diagnostic plot of the quadratic model showing predicted responses versus actual responses.



**Fig. S2.** Effect of NaOH concentrations on the degree of substitution (DS) of cationic starch. Note: The figure was created by the Design Expert software. The solid black line shows the predicted DS values at the reaction time of 3.5 h (average of 2-5 h) and the CHPTAC concentration of 0.088 M (average of 0.053-0.124M), and the blue dash lines represent the 95% confidence interval of the predicted DS.



**Fig. S3.** Differential scanning calorimetry (DSC) thermograms of (a) raw starch (DS=0) extracted from potato peels (blue line) and (b) cationic starch with DS=0.86 (red dashed line).

**Table S1.** ANOVA for quadratic model for degree of substitution (DS) as a response of experimental variables.

Source	Sum of Squares	df	Mean Square	F-value	p-value <sup>a</sup>
<b>Model</b>	0.8878	9	0.0986	121.01	< 0.0001
A-NaOH concentration	0.4739	1	0.4739	581.43	<u>&lt; 0.0001</u>
B-Cationic reagent	0.0035	1	0.0035	4.35	0.0636
C-Reaction time	0.0003	1	0.0003	0.3538	0.5652
AB	0.0000	1	0.0000	0.0189	0.8933
AC	5.74E-06	1	5.74E-06	0.0070	0.9348
BC	0.0425	1	0.0425	52.11	<u>&lt; 0.0001</u>
A <sup>2</sup>	0.1385	1	0.1385	169.96	<u>&lt; 0.0001</u>
B <sup>2</sup>	0.0006	1	0.0006	0.7345	0.4115
C <sup>2</sup>	0.0147	1	0.0147	17.99	<u>0.0017</u>
<b>Residual</b>	0.0082	10	0.0008		
Lack of Fit	0.0082	5	0.0016		
Pure Error	0.0000	5	0.0000		
Cor Total	0.8959	19			

<sup>a</sup> Variables with significant effects ( $p < 0.05$ ) were highlighted with underscore lines.