

Supporting Information

for

pH-Responsive Water-Based Drilling Fluids Containing Bentonite and Chitin Nanocrystals

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Supporting information consists of 8 pages, 3 Figures and 2 Tables.

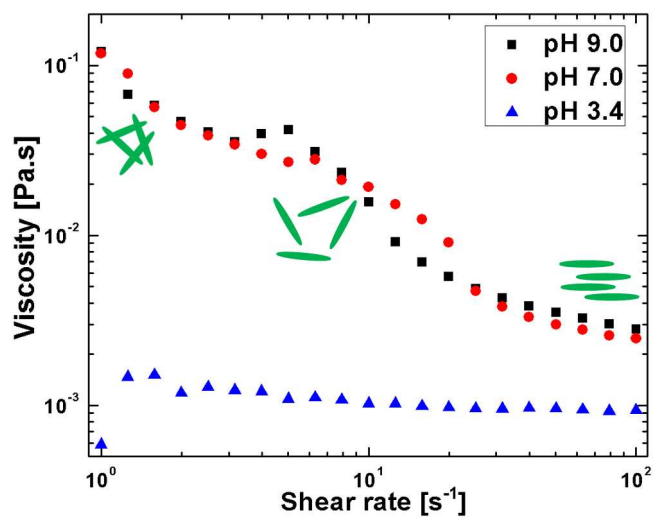


Figure S1. Steady-state viscosity versus shear rate of 0.1 wt% ChNC suspension at pH of 9.0, 7.0 and 3.4.

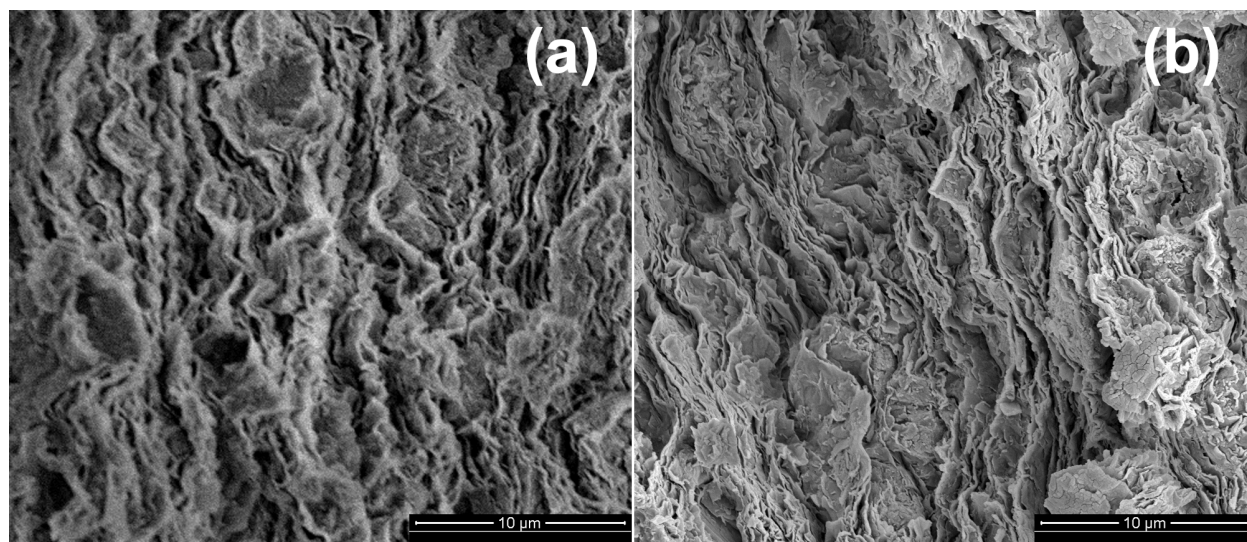


Figure S2. Fractured surface morphology of filter cakes deposited from (a) PAC0.1/ChNC0.1/BT3 and (b) PAC0.2/BT3-WDFs.

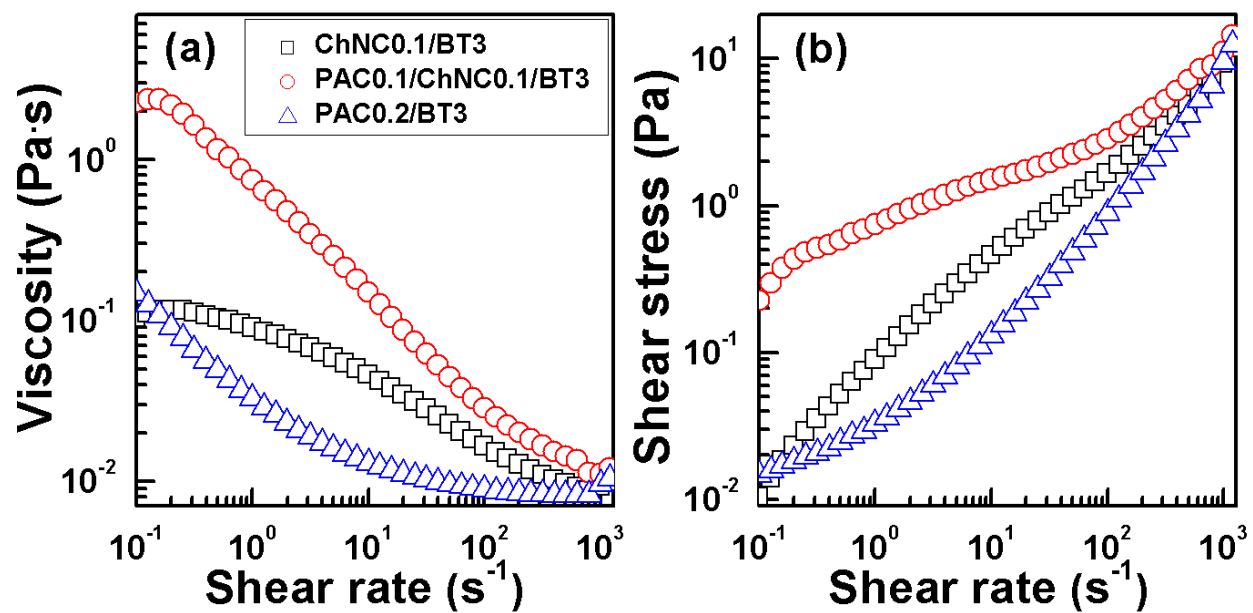


Figure S3. (a) Viscosity and (b) shear stress versus shear rate of ChNC0.1/BT3, PAC0.1/ChNC0.1/BT3 and PAC0.2/BT3-WDFs at pH of 9.0.

Table S1. A comprehensive comparison of the dimensions of ChNCs prepared from different chitin resources using different extraction methods.

Width (nm)	Length (nm)	Aspect ratio	Resources	Extraction method	Ref.
8	340	42.5	Crab shells	TEMPO oxidation, R.T.	1
6	253	42.2	Shrimp shells	TEMPO oxidation, R.T.	2
43.3	446.1	10	Commercial chitin	15~40 wt% H ₂ SO ₄ , 90 , 6 h	3
60	300	5	Lobster waste	3 M HCl, 100 °C, 90 min	4
7-25	314-1571	47-63	Crustacean waste	3 M HCl, 100 °C, 90 min	5
15	200-500	13-33	Commercial chitin	3 M HCl, 104 °C, 90 min	6
50	200-1000	4-20	Commercial chitin	3 M HCl, 104 °C, 90 min	7
9	182	20.2	Shrimp shells	3 M HCl, 105 °C, 2 h	2
16	160	10	Shrimp shells	3 M HCl, 100 °C, 90 min	8
11.1	176	15.8	Shrimp shells	3 M HCl, 100 °C, 90 min	9
20	300	15	Shrimp shells	3 M HCl, 100 °C, 90 min	10
20-40	150-400	-	shrimp shells	3 M HCl, 100 °C, 90 min	11
30-70	200-600	-	shrimp shells	3 M HCl, 100 °C, 90 min	12
10-15	200-500	-	Shrimp shells	3 M HCl, 100 °C, 90 min	13
10-30	400	-	Crab shells	3 M HCl, 80 °C, 90 min	14
4-40	100-600	16	Crab shells	3 M HCl, 100 °C, 90 min	15
12.4	217	17.5	Crab shells	3 M HCl, 100 °C, 90 min	16
8-17	114-320	-	Crab shells	3 M HCl, 100 °C, 90 min	17
14.8	378.9	25.6	Crab shells	3 M HCl, 100 °C, 3h	This study

Table S2. Derived rheological parameters for BT, chitin/BT, ChNC/BT, PAC/BT, and PAC/ChNC/BT-WDFs using the Herschel-Bulkey model.

WDFs	τ_0	K	n	R^2
BT3 - pH 9.0	0.01	1.62×10^{-4}	1.50	0.9995
BT3 - pH 7.0	0.02	1.93×10^{-4}	1.49	0.9991
BT3 - pH 3.4	0.27	1.76×10^{-3}	1.50	0.9975
ChNC0.1/BT3 - pH 9.0	0.20	2.00×10^{-2}	0.89	0.9895
ChNC0.1/BT3 - pH 7.0	0.24	2.91×10^{-3}	1.13	0.9866
ChNC0.1/BT3 - pH 3.4	0.61	1.29×10^{-3}	1.24	0.9924
Chitin0.1/BT3 - pH 9.0	0.03	4.91×10^{-4}	1.38	0.9994
Chitin0.5/BT3 - pH 9.0	0.04	4.31×10^{-4}	1.41	0.9991
PAC0.1/ChNC0.1/BT3- pH 9.0	0.78	6.72×10^{-2}	0.74	0.9854
PAC0.2/BT3- pH 9.0	0.11	2.08×10^{-3}	1.22	0.9949

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