processes

MDPI

Supporting Information

Evaluation of a Novel Polymeric Flocculant for Enhanced Water Recovery of Mature Fine Tailings

Kyle C. Lister [1], Heather Kaminksy [2] and Robin A. Hutchinson [1,*]

1 Department of Chemical Engineering, Queen's University, 19 Division St, Kingston, Ontario, Canada, K7L3N6;
2 Applied Research Centre for Oil Sands Sustainability, Northern Alberta Institute of Technology, 9413 20 Ave NW, Edmonton, Alberta, Canada, T6N 1E5
* Correspondence: robin.hutchinson@queensu.ca; Tel.: +1-613-533-3097

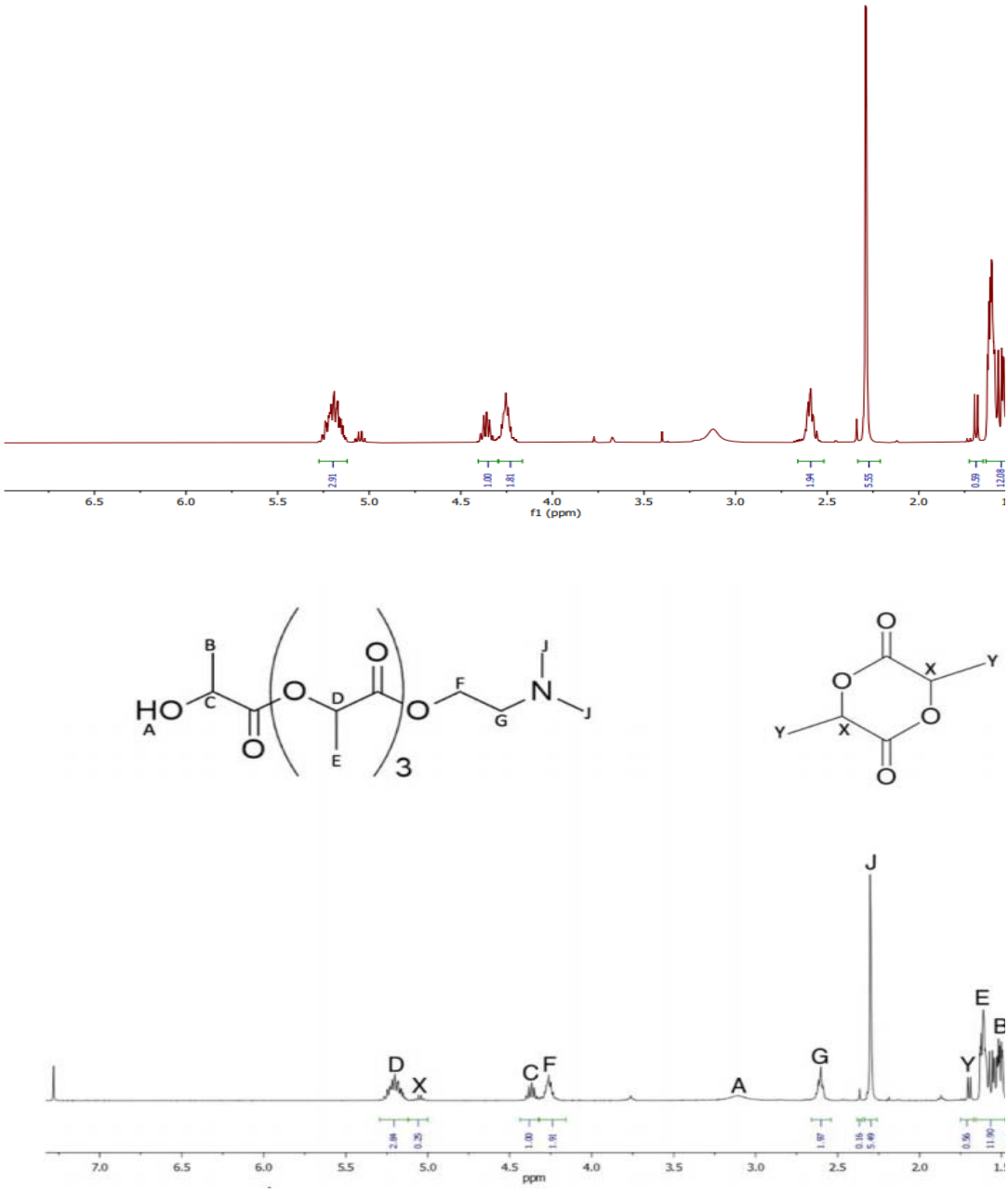

Figure S1: NMR of synthesized PLA$_4$De in CDCl$_3$ (top) compared to standard synthesized in previous work (bottom) [19]. Reproduced with permission of author.

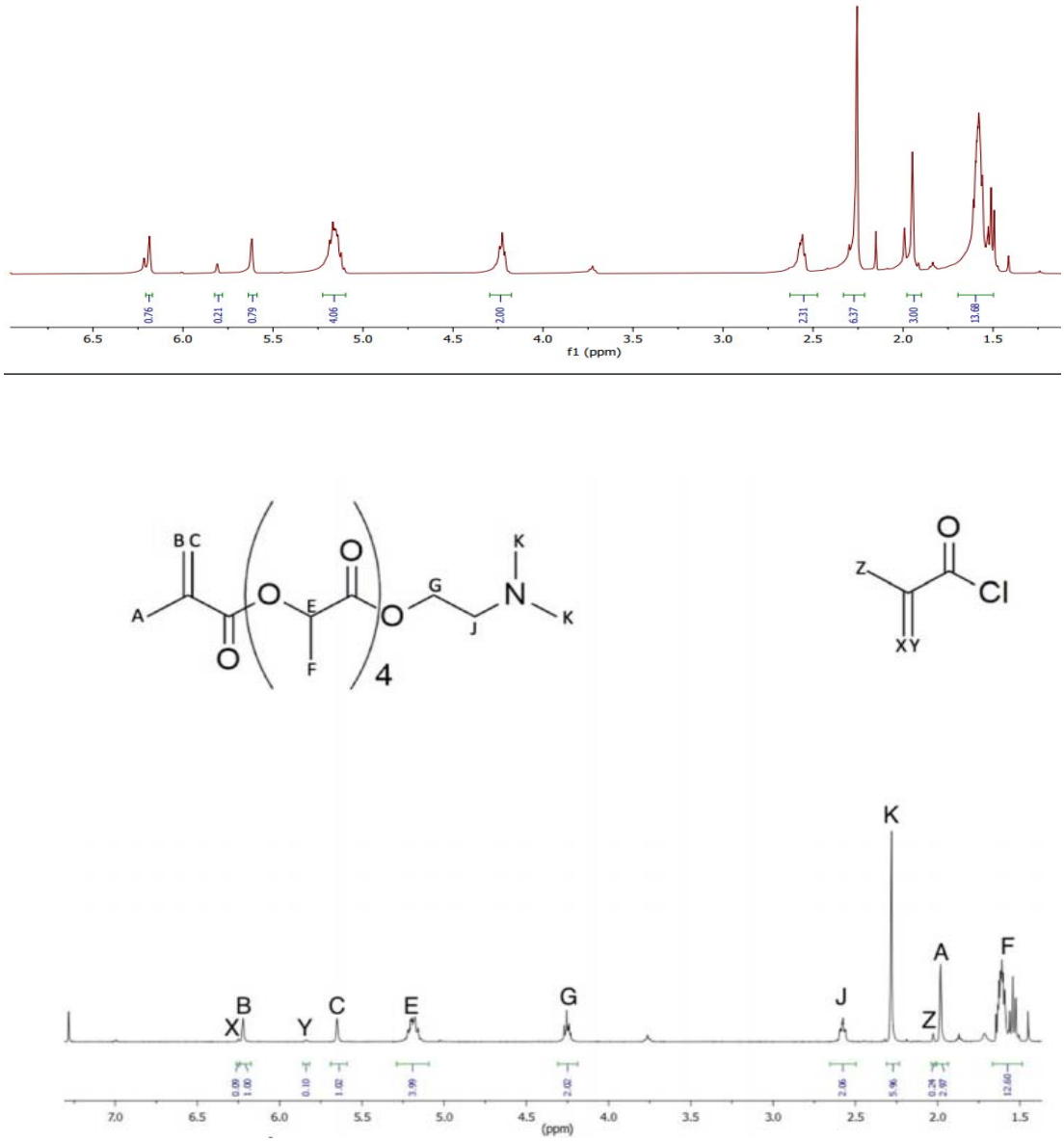

Figure S2: NMR of synthesized PLA$_4$DeMA in CDCl$_3$ (top) compared to standard synthesized in previous work (bottom) [19]. Reproduced with permission of author.

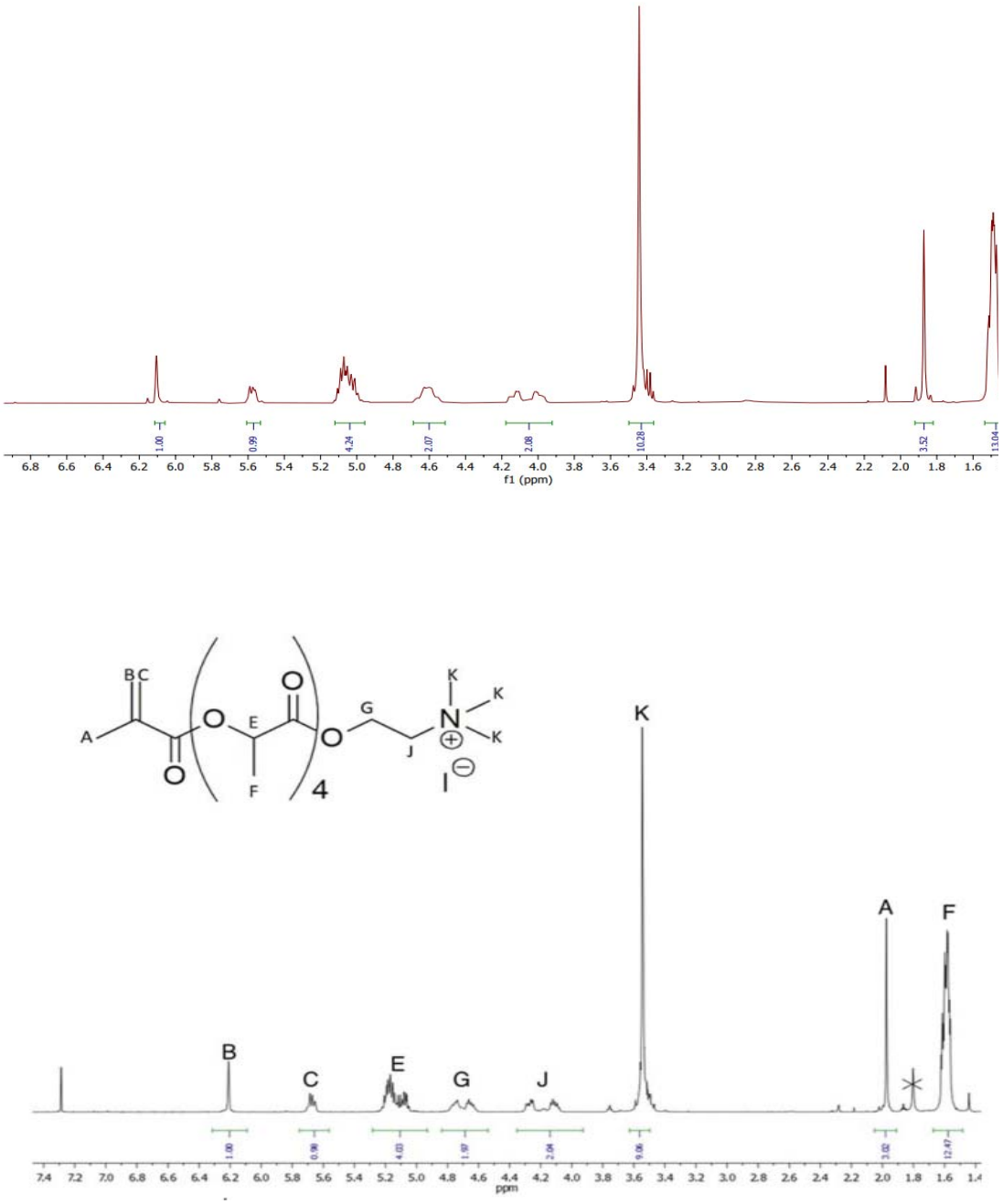

Figure S3: NMR of synthesized PLA_4ChMA in $CDCl_3$ (top) compared to standard synthesized in previous work (bottom) [19]. Reproduced with permission of author.

Table S1: Characterization of MFT used in study of flocculation of diluted MFT

Characterization technique	Compound or ion	Coanda MFT
Dean Stark analysis (wt.%)	Water	61.2
	Solids	34.7
	Bitumen	2.1
Atomic absorption spectroscopy (ppm)	Na^+	251.4
	K^+	19.8
	Ca^{2+}	10.1
	Mg^{2+}	20.3

Table S2: Characterization of MFT used in study of flocculation of undiluted MFT

wt% Bitumen	wt% Mineral	wt.% Water	MBI	vol% Fines
1.23	24.68	73.64	13.2	92.8

Table S3: Characterization of the water chemistry of MFT used in study of flocculation of undiluted MFT

Component	Concentration (mg/L)
Lithium	1.8
Sodium	381.0
Calcium	52.2
Magnesium	34.9
Potassium	20.5
Chloride	205.7
Nitrate	2.79
Nitrite	not detected
Sulfate	303.9
Bromide	not detected
Phosphate	not detected
Fluoride	2.48
Carbonate	9.0
Bicarbonate	300.6

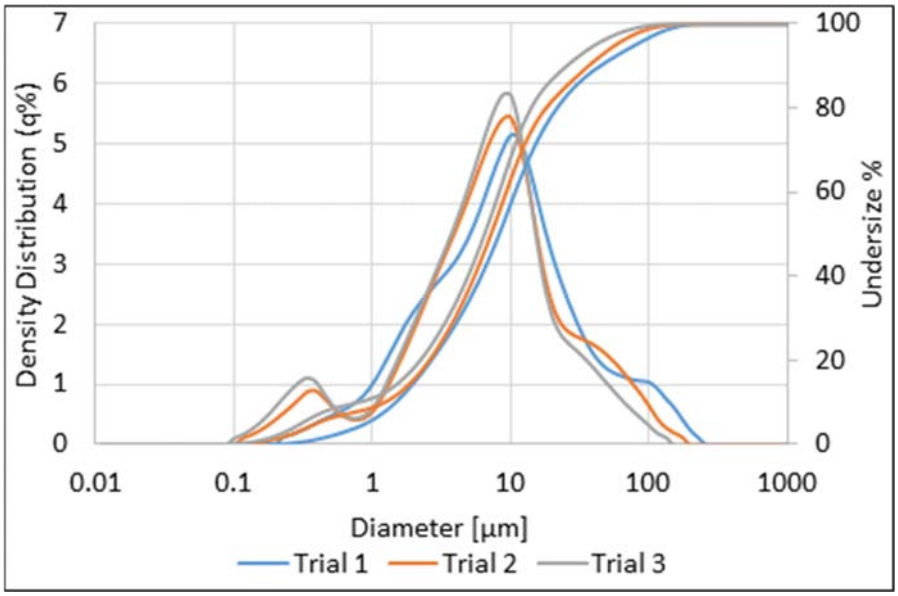

Figure S4: PSD analysis of MFT used in study of flocculation of undiluted MFT

Table S4: Evaluation of the statistical significance of poly(PLA$_4$ChMA) dosage on compaction of 5.0 wt.% MFT in process water using a two-tailed t-test at a confidence level of 95%

Compaction dataset	Dosage (ppm)	Mean	Standard deviation	t	P value (p<0.05)	Significant? (Y/N)_
24 h	500	10.9	1.0	0	1.00	-
	1000	12.0	1.0	1.4	0.23	N
	3000	11.9	0.7	2.6	0.06	N
Degradation	500	20.7	1.0	0	1.00	-
	1000	20.2	0.7	0.7	0.52	N
	3000	19.3	2.0	1.1	0.33	N

Table S5:Evaluation of the statistical significance of compactions of 5.0 wt.% MFT in process water with poly(PLA$_4$ChMA), FLOPAM A3338 and SNF C3276 at 500 ppm using a two-tailed t-test at a confidence level of 95%

Flocculant	Compaction dataset	Mean	Standard deviation	t	P value (p<0.05)	Significant? (Y/N)
poly(PLA$_4$ChMA)	24 h	10.9	1.0	0	1.00	-
	Degradation	20.7	1.0	0	1.00	-
FLOPAM	24 h	15.3	0.3	7.3	0.01	Y
	Degradation	18.7	0.5	3.3	0.03	Y
SNF C3276	24 h	10.2	1.0	0.9	0.42	N
	Degradation	18.4	1.0	5.6	0.01	Y