

Contents

1	Operational Principles and Material Requirements for Coagulation/Flocculation and Adsorption-based Water Treatment Operations	1
1.1	Introduction	1
1.2	Operational Principles of Adsorption and Coagulation/Flocculation	2
1.2.1	Adsorption Based Water Treatment Operations	2
1.2.2	Coagulation/Flocculation Treatment Operations	4
1.3	Material Requirements for Adsorption and Coagulation/Flocculation	5
1.3.1	Adsorption Based Treatment Operation	5
1.3.2	Coagulation/Flocculation Operations	6
1.4	Polysaccharides—A Brief Overview	7
1.5	Justification and the Theoretical Basis for the Use of Polysaccharides	7
1.5.1	Adsorption-based Water Treatment Operations	7
1.5.2	Coagulation/Flocculation Treatment Operations	8
1.6	Conclusion	9
	References	10
2	Mechanistic Insight into the Coagulation Efficiency of Polysaccharide-based Coagulants	13
2.1	Polysaccharides-A Brief Overview	13
2.2	Polysaccharide-based Coagulants	14
2.3	Overview of Active Coagulating Species in Polysaccharide-based Coagulants	15
2.3.1	Chitosan	18
2.3.2	Seed Gums	18
2.3.3	Fruit Wastes	20
2.3.4	Mucilage	21

2.3.5	Plant Seed Extracts	21
2.3.6	Polyphenolics	22
2.3.7	Starch	23
2.3.8	Actinobacteria	24
2.3.9	Alginate	25
2.4	Underlying Mechanisms of Coagulation-Flocculation	
	Process	26
2.4.1	Double-Layer Compression	26
2.4.2	Charge Neutralization	26
2.4.3	Adsorption and Bridging	26
2.4.4	Sweep Coagulation	27
2.4.5	Insight into the Coagulation Mechanism of PBC	27
2.5	Conclusion	29
	References.	29
3	Tuning Polysaccharide Framework for Optimal Coagulation	
	Efficiency	37
3.1	Introduction	37
3.2	The Skeletal Framework of Polysaccharides	38
3.3	Justification and Theoretical Basis for Modifying Polysaccharide Framework	39
3.4	Advances and Mechanistic Insight into the Modification of Polysaccharide Framework	44
	3.4.1 Modified Chitosan Flocculants	44
	3.4.2 Plant-based Bioflocculants	48
	3.4.3 Flocculation Mechanism of Bioflocculants	51
	3.4.4 Plant-based Grafted Bioflocculants	51
3.5	Performance Evaluation of Modified and Unmodified Polysaccharides	56
	3.5.1 Performance Evaluation of Chitosan-based Flocculants	56
	3.5.2 Performance Evaluation of Modified Chitosan-based Flocculants	58
	3.5.3 Performance Evaluation of Combined Flocculation with Chitosan-based Flocculants as Coagulant Aids	58
	3.5.4 Performance Evaluation of Unmodified Bioflocculants In Industrial Wastewater Treatment	58
3.6	Conclusions	60
	References.	61

4	Progress and Prospects of Polysaccharide Composites as Adsorbents for Water and Wastewater Treatment.	65
4.1	Progress in Preparation of Polysaccharide-based Adsorbents	65
4.1.1	Crosslinked Polysaccharides	65
4.1.2	Polysaccharide Composites	67
4.1.3	Nanoporous Polysaccharide Composites	70
4.2	Treatment of Water and Wastewater.	71
4.2.1	Pollutant Removal.	71
4.2.2	Adsorption Mechanism	74
4.2.3	Regeneration Techniques.	77
4.2.4	Polysaccharide-based Adsorbents Versus Other Adsorbents	79
4.3	Prospects and Challenges	81
4.4	Conclusion	83
	References.	83
5	Tapping into Microbial Polysaccharides for Water and Wastewater Purifications.	91
5.1	Introduction	91
5.2	General Applications of Microbial Polysaccharides	92
5.3	Microbial Polysaccharide in Water and Wastewater Purification	94
5.4	Characterization of Microbial Polysaccharides for Water and Wastewater Purification	95
5.5	Morphologic and Functional Properties of Microbial Polysaccharides.	96
5.5.1	Lipopolysaccharides (LPS)	97
5.5.2	Capsular Polysaccharides (CPS)	97
5.5.3	Exopolysaccharides (EPS).	97
5.6	Roles of Exopolysaccharides in Biofilm Formation	99
5.7	Microbial Biofilms in Water and Wastewater Treatment: The Dual Action.	100
5.7.1	Antibiofilms in Water and Wastewater Treatment.	101
5.8	Analytical Methods for Assessment of Microbial Polysaccharides in Water and Wastewater	102
5.8.1	Biological Oxygen Demand (BOD).	103
5.8.2	Chemical Oxygen Demand (COD)	104
5.8.3	Total Suspended Solids (TSS).	104
5.8.4	Nitrification and Denitrification (Ammonium Test).	105
5.9	Trends and Prospects of Microbial Polysaccharides in Water and Wastewater Purification.	106
5.10	Conclusion	107
	References.	107

Polysaccharides as a Green and Sustainable Resources
for Water and Wastewater Treatment

Oladoja, N.A.; Unuabonah, E.I.; AMUDA, O.S.; Kolawole,
O.M.

2017, XIV, 110 p. 16 illus., Softcover

ISBN: 978-3-319-56598-9